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FINAL REPORT

Studies

*No. 4A**

PROJECTED MARKET CONDITIONS

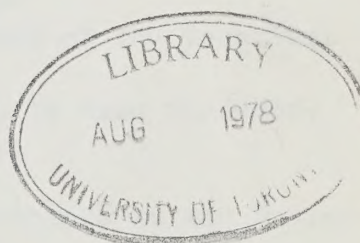
FOR FEMALE LABOUR IN 1980

FOR

THE ROYAL COMMISSION ON THE

STATUS OF WOMEN IN CANADA

1970



* Temporary number until the report with its assigned study number is published by the Royal Commission on the Status of Women

Rotec-Contract No.141

August 7, 1968



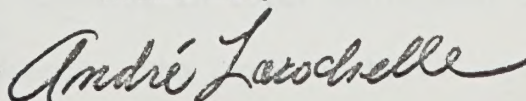
P R E F A C E

This is the final and complete report regarding our study entitled PROJECTED MARKET CONDITIONS FOR FEMALE LABOUR IN 1980 commissioned by the Royal Commission on the Status of Women in Canada. This "final" report follows comments by the Commission on our preliminary and confidential report dated July 19, 1968.

Section I treats the subject of Female Labour in the Post-War Economy (1946-1967) and is a prelude to Section II which presents projections of the Female Labour Force in 1980 by marital status and age group for Canada, and by region for the total supply of female labour. Section III deals with the behaviour of demand for female labour since 1946 and with projections of Female Employment (labour force minus unemployment) in 1980 by occupation group and industry for Canada, and by region for the total demand for female labour. An Appendix covering some of the technical aspects of the econometric methods used is also included.

We would like to express our thanks to the Dominion Bureau of Statistics for its collaboration and particularly to Mr. Armand L. Cloutier of the Special Surveys Division. The research team comprised Messrs. Raymond Depatie, M.A., economist, Gilles Gélinas, B.A., computer analyst, Gilles Proulx, B.Sc., economist, Marcel G. Dagenais, Ph.D., and the undersigned, econometricians.

ROTEC INC.



André Larochelle, M.A.
Econometrician
Project Director

Montreal, August 7, 1968.

A B S T R A C TPurpose

The purpose of this study is to make projections of the supply of female labour (or female labour force) by marital status, age group and region and of the demand for female labour (or female employment) by occupation group, sector of the economy and region, for 1980, in Canada.

Method

a) Female Labour Force in 1980

The method used to project the female labour force for 1980 involves making projections of female participation rates for that year and applying the results to the working age population projections made by the Economic Council of Canada for 1980. A participation rate forecasting model is used; it is expressed as a general linear regression model whose parameters are estimated with the use of either annual or quarterly data. The form and features of this model are based on a detailed analysis of the Post-War evolution of female employment, unemployment, labour force and participation rate.

b) Demand for Female Labour in 1980

The method used in order to project the demand for female labour for 1980 consists in two main steps. The first one is to project, by means of semi-logarithmic regressions, the total production of goods and the total production of services, for 1980; the sum of these two projections gives the projected total production of goods and services of the Canadian economy for 1980. Linear regressions are then used to project the level of productivity in the private sector of the economy for 1980, as well as the share of female employment in total employment for that year. From these results, the increase in total employment from 1966 to 1980 is derived and, consequently, the level of total employment for 1980. By applying the projected share of female employment in total employment for 1980 to the level of total employment for that year, a projection of total female employment for 1980 is obtained.

The second step consists in projecting, by means of linear regressions, the percentage distribution of total female employment by occupation group, by sector of the economy and by region of the country, for 1980. If these projected percentage distributions are applied to the total female employment projected for 1980, the projection of the number of employed women by occupation group, by sector and by region is obtained for that year.

Post-War Evolution

a) Female Labour Force (1948-1967)

Between 1948 and 1967, the total female labour force more than doubled, but it increased twice as much since 1957 as it had in the previous ten years. Approximately one half of the increase in the total female labour force from 1948 to 1967 can be accounted for by the fact that the total female labour force participation rate increased from 23.5% in 1948 to 33.8% in 1967. This increase in the total female participation rate entirely took place since 1956; the rate had remained constant, on the average, from the end of World-War II to 1955. The growth of the female participation rate since 1956 was due primarily to sharp increases in the participation rates of women aged between 25 and 64; since the participation rate for single women did not change appreciably, this can be ascribed to a massive entry of married women in the labour force. The participation rate for women aged 20 to 24 and that for women 65 and over increased slightly. On the other hand, the participation rate for teenage girls actually declined under the influence of increased high school enrolment rates. During this 1948-67 period, female employment has increased as fast as the female labour force, so that, on the average, conditions of full-employment prevailed for women workers.

b) Demand for Female Labour (1948-1967)

During the twenty-year period that extends from 1948 to 1967, total female employment, which is equivalent to the demand for female labour, more than doubled. However, it has increased twice as much during the second decade as it had during the first ten years of the 1948-67 period.

From the point of view of the main sectors of the economy, female employment increased much faster in community, personal, recreational and business services than in any other sector. Female employment actually dropped in agriculture over the 1948-67 period while it is in manufacturing that it increased the least. It grew more or less in line with total female employment in trade, in transportation and communications and in public administration.

The share of female employment in total employment has increased from 22.6% in 1946 to 31.1% in 1967, with most of the increase having taken place since 1955.

As far as the different occupation groups are concerned, there were considerable increases in the number of female professionals and technicians, female managers, office workers and service workers. But the number of saleswomen and female production workers increased much less than total female employment and that of female farm workers actually dropped. As for the principal regions of the country, increases in female employment for the Atlantic region, Quebec and Ontario over that twenty-year period were close to that for the country as a whole but the growth of female employment was much lower for the Prairies and much higher for British Columbia.

Projection Results for 1980

Tables A and B give the projection results as such for both the supply of and the demand for female labour in 1980. It can be seen that, from 1967 to 1980, the total supply of female labour (or total female labour force) is projected to increase by 73.1% while the total demand for female labour (or total female employment) is projected to increase by 74.4%. If demand actually increases by slightly more than supply, a slight drop in the unemployment rate for female workers will result in 1980.

a) 1980 Female Labour Force

From the supply side (labour force), it is of interest to note that more than half of the projected increase in the total female labour force between 1967 and 1980 can be attributed to the projected increase in the female participation rate from 33.8% in 1967 to 44.6% in 1980.



As can be seen, the largest percentage increases in the labour force between 1967 and 1980 are projected for married women (85.5%), the Prairies (89.2%), British Columbia (97.8%), the 25-34 (117.9%), the 55-64 (126.3%) and the 65 and over (105.4%) age groups. Relatively small increases are projected for widowed, divorced or separated women (36.5%), the Atlantic region (50.1%), the 14-19 (25.8%) and the 35-44 (48.5%) age groups. In general, a high projected increase in a specific labour force group is associated with a corresponding high projected increase in the participation rate of the group, and conversely.

b) 1980 Demand for Female Labour

From the demand side, it can be seen that, as far as the occupation groups are concerned, the largest increases between 1967 and 1980 are projected to take place in the number of female professionals and technicians (128.1%), farm workers (94.1%) and service workers (84.4%). On the other hand, there should be practically no change in the number of female production workers (2.7%) while that of saleswomen should not increase greatly (39.6%). If the different sectors of the economy are considered, it can be seen that the largest increases in female employment are projected to take place in community, personal, recreational and business services (116.3%) and in agriculture (83.3%). Female employment is projected to decline in transportation and communications (-18.9%) and to increase only slightly in manufacturing (5.8%). As in the case of saleswomen, female employment is projected to show only a moderate increase in total trade (43.7%). For the main regions of the country, the largest gains in female employment between 1967 and 1980 should take place in Western Canada; 101.3% in British Columbia and 89.5% in the Prairies. Female employment should increase by 76.6% in Quebec while it should increase by less than for the country as a whole (74.4%) in Ontario (64.4%) and in the Atlantic Region (50.8%). We also expect that in 1980, at least 39.5% of female workers should have a complete secondary education or more (34.0% in 1961), and that at least 3.7% of female workers should have a complete university education or more (2.7% in 1961).

TABLE A - TABLEAU A

THE 1980 SUPPLY OF FEMALE LABOUR - L'OFFRE DE MAIN-D'OEUVRE FEMININE EN 1980

GROUP GROUPE	Participation Rate Taux de Participation (%)		Labour Force (1) Main-d'oeuvre (1) (,000)		Variation 1967 - 80 (%)		Distribution (%)	
	1967	1980	1967	1980			1967	1980
Total, 14 - + (years-ans)	33.8	44.6	2,365	4,095	73.1		100.0	100.0
Marital Status - Etat Matrimonial								
Single - Célibataires	49.6	55.5	886	1,452	63.8		37.4	35.5
Married - Mariées	28.3	42.2	1,260	2,336	85.5		53.3	57.1
Others - Autres	28.9	29.2	220	300	36.5		9.3	7.4
Region - Région								
Atlantic - Atlantique	27.8	36.2	184	276	50.1		7.8	6.7
Quebec - Québec	32.5	42.4	660	1,156	75.3		27.9	28.2
Ontario	36.3	44.3	906	1,476	62.9		38.3	36.1
Prairies	33.7	53.5	379	717	89.2		16.0	17.5
British Columbia Colombie-Britannique	34.5	46.0	237	469	97.8		10.0	11.5

.....cont'dsuite

TABLE A - TABLEAU A (Continued 1 - Suite 1)

THE 1980 SUPPLY OF FEMALE LABOUR - L'OFFRE DE MAIN-D'OEUVRE FEMININE EN 1980

GROUP GROUPE	Age (Sub-) Group - (Sous-) Groupe d'âge	Participation Rate Taux de participation (%)		Labour Force (1) Main-d'oeuvre (1) (,000)		Variation 1967 - 80 (%)		Distribution (%)	
		1967	1980	1967	1980			1967	1980
14 - 19		31.6	34.1	357	449	25.8	15.1	11.0	
20 - 24		56.6	65.0	433	722	66.7	18.3	17.6	
25 - 44		35.7	47.8	892	1,591	78.4	37.7	38.9	
	25 - 34	34.4	46.8	424	924	117.9	17.9	22.6	
	35 - 44	37.0	51.4	468	695	48.5	19.8	17.0	
45 - 64		35.1	53.5	639	1,236	93.4	27.0	30.2	
	45 - 54	39.7	58.8	422	719	70.4	17.8	17.6	
	55 - 64	28.6	45.1	217	491	126.3	9.2	12.0	
65 - +		5.9	8.5	46	95	105.4	1.9	2.3	

(1) SEE NEXT PAGE
VOIR PAGE SUIVANTE

TABLe A - TABLEAU A (Continued 2 - Suite 2)
THE 1980 SUPPLY OF FEMALE LABOUR - L'OFFRE DE MAIN-D'OEUVRE FEMININE EN 1980

- (1) Corresponding to a source population projected by the Economic Council of Canada (Staff Study No. 19, 1967) under an assumption of a net annual inflow of 70,000 immigrants into Canada from 1967 to 1980.
- The total for the labour force groups and sub-groups may differ with each other because they result from independent projections.
- (1) En utilisant la prévision de population de 14 ans et plus effectuée par le Conseil Economique du Canada (Etude no 19, 1967) sous le postulat d'une immigration canadienne nette de 70,000 par année entre 1967 et 1980.
- Les totaux des (sous-) groupes de main-d'oeuvre peuvent varier étant donné qu'ils proviennent de prévisions indépendantes.

TABLE B - TABLEAU B

THE 1980 DEMAND FOR FEMALE LABOUR - LA DEMANDE DE MAIN-D'OEUVRE FEMININE EN 1980

GROUP - GROUPE	Number-Nombre (, 000)		Variation 1967-1980 (%)	Percent of Total Female Employment Pourcent de l'emploi féminin total	
	1967	1980		1967	1980
<u>Total</u>	2,296	4,005	74.4	100.0	100.0
<u>Occupation Group-Groupe de professions</u>					
Managers-Administratrices	86	148	72.1	3.7	3.7
Professionals and technicians - Professionnelles et techniciennes	395	901	128.1	17.2	22.5
Service workers - Travailleuses de services	558	1,029	84.4	24.3	25.7
Saleswomen-Vendeuses	192	268	39.6	8.4	6.7
Production workers-Travailleuses de production	257	264	2.7	11.2	6.6
Office workers-Travailleuses de bureau	704	1,210	71.9	30.7	30.2
Farm workers-Travailleuses agricoles	68	132	94.1	3.0	3.3
Other occupations-Autres professions	36	52	44.4	1.6	1.3

....cont'd

TABLE B - TABLEAU B (cont'd 1 - suite 1)

THE 1980 DEMAND FOR FEMALE LABOUR - LA DEMANDE DE MAIN-D'OEUVRE FEMININE EN 1980

GROUP - GROUPE	Number-Nombre (, 000)		Variation 1967-1980 (%)	Percent of Total Female Employment Pourcent de l'emploi féminin total	
	1967	1980		1967	1980
<u>Sector - Secteur</u>					
Community, Recreational Business and Personal Services-Services personnels, récréatifs, communautaires et d'affaires	1,048	2,267	116.3	45.6	56.6
Transportation and communications- Transports et communications	74	60	-18.9	3.2	1.5
Wholesale and Retail Trade- Commerce de gros et de détail	407	585	43.7	17.7	14.6
Manufacturing-Manufactures	394	417	5.8	17.2	10.4
Public Administration- Administration publique	106	184	73.8	4.6	4.6
Agriculture	72	132	83.3	3.1	3.3
Finance	148	260	75.7	6.4	6.5
Other Sectors-Autres secteurs	47	100	112.8	2.0	2.5

.....cont'd

.....suite

TABLE B - TABLEAU B (cont'd 2 - suite 2)

THE 1980 DEMAND FOR FEMALE LABOUR - LA DEMANDE DE MAIN-D'OEUVRE FÉMININE EN 1980

GROUP - GROUPE	Number-Nombre (,000)		Variation 1967-1980 (%)	Percent of Total Female Employment Pourcent de l'emploi féminin total	
	1967	1980		1967	1980
<u>Region - Région</u>					
Atlantic-Atlantique	179	270	50.8	7.8	6.7
Québec	636	1,123	76.6	27.7	28.0
Ontario	881	1,448	64.4	38.4	36.2
Prairies	373	707	89.5	16.2	17.7
British Columbia-Colombie-Britannique	226	455	101.3	9.8	11.4

RESUME

But

Le but de cette étude est d'établir des projections, pour le Canada en 1980, de l'offre de travailleurs féminins (la main-d'oeuvre féminine) selon l'état matrimonial, le groupe d'âge et la région ainsi que de la demande de travailleurs féminins (l'emploi féminin) selon la profession, le secteur de l'économie et la région.

Méthode

a) La main-d'oeuvre féminine en 1980

La méthode utilisée pour projeter la main-d'oeuvre féminine en 1980 consiste essentiellement à établir des projections des taux de participation féminins pour cette même année puis à en appliquer les résultats aux projections de la population en âge de travailler effectuées par le Conseil Economique du Canada pour 1980. Les projections de taux de participation sont établies au moyen d'un modèle général de régression multiple (linéaire) dont les paramètres sont estimés à partir de données annuelles ou trimestrielles. La forme de même que les caractéristiques de ce modèle ont été déterminées à partir d'une analyse détaillée de l'évolution, depuis une vingtaine d'années, de l'emploi, du chômage, de la main-d'oeuvre et du taux de participation féminins.

b) La demande de travailleurs féminins en 1980

La méthode utilisée pour projeter la demande de main-d'oeuvre féminine en 1980 comprend deux étapes principales. La première consiste à établir, au moyen de régressions semi-logarithmiques (exponentielles), des projections de la production totale de biens ainsi que de la production totale de services, en 1980. La somme de ces deux projections donne la production totale de biens et services de l'économie canadienne en 1980. Ensuite, le niveau de la productivité dans le secteur privé de l'économie en 1980 de même que la part de l'emploi féminin dans l'emploi total pour cette même année sont déterminés au moyen de projections utilisant des régressions linéaires. A partir de ces résultats, l'accroissement de l'emploi total entre 1966 et 1980 est dérivé ainsi que, par conséquent, le niveau de l'emploi total en 1980.

La projection de la part de l'emploi féminin dans l'emploi total en 1980 est appliquée à celle du niveau de l'emploi total pour cette même année pour obtenir une projection de l'emploi féminin en 1980. La seconde étape consiste à établir, au moyen de régressions linéaires, des projections de la distribution procentuelle de l'emploi féminin total par profession, par secteur de l'économie et par région du pays, pour 1980. Pour obtenir l'emploi féminin en 1980 selon la profession, le secteur et la région, il suffit alors d'appliquer les projections de distributions procentuelles à la projection de l'emploi féminin total en 1980.

L'évolution d'après-guerre

a) La main-d'oeuvre féminine (1948-1967)

Entre 1948 et 1967, la main-d'oeuvre féminine totale a plus que doublé mais elle s'est accrue deux fois plus rapidement depuis 1957 qu'au cours des dix années antérieures. Environ la moitié de cet accroissement de la main-d'oeuvre féminine totale entre 1948 et 1967 est attribuable à l'augmentation du taux de participation féminin; ce dernier est passé de 23.5% en 1948 à 33.8% en 1967. Cet accroissement du taux de participation féminin s'est produit entièrement entre 1956 et 1967; il était demeuré constant, en moyenne, de la fin de la Seconde Guerre Mondiale jusqu'à 1955. Cette augmentation du taux de participation féminin depuis 1956 est attribuable pour une large part à l'accroissement substantiel des taux de participation des femmes âgées de 25 à 64 ans; ceci provient principalement d'une entrée massive des femmes mariées dans la main-d'oeuvre puisque le taux de participation des femmes célibataires n'a presque pas changé. Le taux de participation des femmes âgées de 20 à 24 ans de même que celui des femmes âgées de 65 ans et plus n'ont augmenté que faiblement. Par contre, le taux de participation des jeunes filles (14-19 ans) a effectivement diminué sous l'influence de l'augmentation du taux de fréquentation scolaire. Durant cette période qui va de 1948 à 1967, l'emploi féminin s'est généralement accru au même rythme que la main-d'oeuvre féminine, de sorte qu'en moyenne, une situation de plein-emploi a prévalu tout au long de la période pour les travailleurs féminins.

b) La demande de travailleurs féminins

Au cours de la période de vingt ans qui s'étend de 1948 à 1967, l'emploi féminin total, qui équivaut à la demande de travailleurs féminins, s'est accru de plus du double. Toutefois, il a augmenté deux fois plus rapidement au cours de la seconde décennie qu'entre 1948 et 1957. Du point de vue des principaux secteurs de l'économie, l'emploi féminin s'est accru beaucoup plus rapidement dans les services communautaires, personnels récréatifs et d'affaires que dans n'importe quel autre secteur. L'emploi féminin a effectivement diminué dans l'agriculture au cours de la période 1948-67 et c'est dans le secteur manufacturier qu'il s'est accru le plus faiblement. Dans le commerce, dans les transports et communications et dans l'administration publique, l'emploi féminin a augmenté à peu près dans les mêmes proportions que l'emploi féminin total.

La part de l'emploi féminin dans l'emploi total est passé de 22.6% en 1946 à 31.1% en 1967; cet accroissement s'est produit presque entièrement depuis 1956.

Pour ce qui est des différentes professions, il s'est produit des augmentations considérables dans le nombre des professionnelles et techniciennes, dans celui des administratrices ainsi que dans celui des travailleuses de bureau et de services. Cependant, le nombre de vendeuses et celui des travailleuses de production s'est accru dans des proportions beaucoup moindres que l'emploi féminin total alors que le nombre de travailleuses agricoles a diminué. Quant aux principales régions du pays, l'augmentation de l'emploi féminin dans la région de l'Atlantique, le Québec et l'Ontario a été à peu près le même, proportionnellement, que l'accroissement de l'emploi féminin pour l'ensemble du pays, au cours de cette période de vingt ans. Par contre, la croissance de l'emploi féminin a été beaucoup plus faible dans les Prairies et beaucoup plus forte en Colombie-Britannique.

Résultats des projections pour 1980

Les Tableaux A et B présentent les résultats des projections comme telles, tant pour l'offre que pour la demande de travailleurs féminins en 1980.

Comme on peut le constater, de 1967 à 1980, l'offre totale de travailleurs féminins (ou la main-d'oeuvre féminine totale) devrait, selon les projections obtenues, s'accroître de 73.1% alors que la demande de travailleurs féminins (ou l'emploi féminin total) devrait augmenter de 74.4%. Si, effectivement, la demande augmentait légèrement plus que l'offre, une faible diminution du taux de chômage pour les travailleurs féminins se produirait en 1980.

a) L'offre de travailleurs féminins en 1980

Du point de vue de l'offre, il est intéressant de noter que plus de la moitié de l'accroissement projeté dans la main-d'oeuvre féminine totale entre 1967 et 1980 provient de l'accroissement projeté dans le taux de participation féminin; ce dernier doit passer de 33.8% en 1967 à 44.6% en 1980. On peut voir que les plus fortes augmentations dans la main-d'oeuvre féminine entre 1967 et 1980 doivent se produire, selon les projections obtenues, pour les femmes mariées (85.5%), pour les Prairies (89.2%), pour la Colombie-Britannique (97.8%) et pour les groupes d'âge 25-34 ans (117.9%), 55-64 ans (126.3%) et 65 ans et plus (105.4%). Des augmentations relativement faibles doivent se produire pour les femmes divorcées, séparées ou veuves (36.5%), pour la région de l'Atlantique (50.1%) et pour les groupes d'âge 14-19 ans (25.8%) et 35-44 ans (48.5%). En général, une forte augmentation projetée pour un groupe spécifique de main-d'oeuvre est associée à un fort accroissement correspondant projeté pour le taux de participation du groupe, et inversement.

b) La demande de travailleurs féminins en 1980

Du point de vue de la demande, on peut constater qu'en ce qui concerne les professions, les plus fortes augmentations entre 1967 et 1980 devraient se produire dans le nombre de professionnelles et techniciennes (128.1%), dans celui des travailleuses agricoles (94.1%) et dans celui des travailleuses de services (84.4%). Par contre, on ne prévoit pratiquement pas de changement dans le nombre des travailleuses de production (2.7%) alors que celui des vendeuses ne devrait augmenter que modérément (39.6%).

Pour ce qui est des différents secteurs de l'économie, on peut voir que c'est dans les services communautaires, récréatifs et d'affaires (116.3%) ainsi que dans l'agriculture (83.3%) que devraient se produire les accroissements les plus considérables dans l'emploi féminin. Celui-ci devrait diminuer dans les transports et communications (-18.9%) et n'augmenter que faiblement dans le secteur manufacturier (5.8%). Comme c'est le cas pour les vendeuses, l'emploi féminin devrait s'accroître modérément dans le commerce (43.7%). Quant aux principales régions du pays, les plus fortes progressions dans l'emploi féminin entre 1967 et 1980 devraient se produire dans la partie ouest du Canada; 101.3% en Colombie-Britannique et 89.5% dans les Prairies. L'emploi féminin devrait augmenter de 76.6% au Québec alors qu'il devrait croître proportionnellement moins que dans l'ensemble du pays (74.4%) en Ontario (64.4%) et dans la région de l'Atlantique (50.8%). Nous prévoyons également qu'en 1980, au moins 39.5% des travailleurs féminins devraient posséder une éducation secondaire complète ou plus (34.0%, en 1961) et qu'au moins 3.7% des travailleurs féminins devraient posséder une éducation universitaire complète ou plus (2.7%, en 1961).

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SECTION I

FEMALE LABOUR IN THE POST-WAR ECONOMY

In this first section of our report, we shall deal exclusively with the most striking features of the evolution of female labour in the last twenty years. The features we are mostly interested in at this stage are those that have a direct bearing on the problem of projecting the supply of female workers in 1980. A certain number of very interesting studies have already been published on the subject of women workers in Canada, both by the Federal Department of Labour and the Dominion Bureau of Statistics (special labour force studies). These studies deal with practically every measurable aspect of female labour and, therefore, give considerable insights on the world of women in the labour market. (1) Although a large part of the information contained in these studies is highly relevant to the making of labour force projections, it is not necessary to dwell upon it in detail in the course of this section, except insofar as it can help to explain the behaviour of certain time-series.

As will be seen later, United States data have been widely used in the present study. Because of the similarity in the sociological patterns and the institutional background of the economy between the United States and Canada, it was thought desirable to analyze simultaneously in both countries the evolving features of female labour. As in other matters, much can be learned from the American experience on this subject.

A graphical presentation is added at the end of this report in order to illustrate the behaviour of the main time-series of interest in this study.

(1) For example, see Ostry, Mrs. Sylvia and Meltz, Noah M., "Les nouvelles tendances de l'emploi des femmes", Bureau de la main-d'oeuvre féminine, Ministère du travail du Canada, Imprimeur de la Reine, Ottawa, 1966, 79 pages.

TABLE 57

AVERAGE ANNUAL EARNINGS OF FEMALE WAGE-EARNERS BY OCCUPATION GROUP, 1961

Total, all occupations	\$1,995
Managers	3,207
Professionals and technicians	2,996
Office workers	2,340
Saleswomen	1,367
Service workers	1,240
Farm workers	607
Production workers	1,757
Other occupations	1,913

Source: D.B.S., Census of Canada, 1961, 94-509

TABLE 58

WOMEN WHO HAVE COMPLETE SECONDARY AND UNIVERSITY EDUCATION AS
A PERCENT OF ALL WOMEN IN EACH OCCUPATION GROUP, 1961

	<u>Complete secondary education or more</u>	<u>Complete university education</u>
Total, all occupations	34.0%	2.7%
Managers	32.9	3.0
Professionals and technicians	81.3	13.9
Office workers	46.3	1.1
Saleswomen	22.0	0.5
Service workers	12.9	0.4
Farm workers	8.4	0.2
Production workers	7.3	0.1
Other occupations	32.1	0.9

Note: The percentages given above refer to the total female labour force, not to total female employment.

Source: D.B.S., Census of Canada, 1961, 94-509

Growth of the Labour Force⁽¹⁾ and Employment

Table 1 gives estimates of the total, female and male labour forces for each year since 1947. Before proceeding any further it seems appropriate to give the definitions of a few technical terms. The labour force comprises, in the Dominion Bureau of Statistics' terminology, persons who are employed and those who are classified as unemployed. An employed person can work either full-time or part-time; there is no minimum number of hours of work per week required in order to be classified as employed. This is a very important point to bear in mind because when we say that over two million women were employed in Canada in 1967, it does not necessarily mean that over two million Canadian women were getting each week what a 40 hours work-week would mean in terms of the size of their take-home pay.⁽²⁾ As for the unemployed, they are persons who, although out of work, wish to work and are actively seeking employment. This last point is most important since persons who have stopped looking for work because they became discouraged about the possibility of finding a job are not unemployed; they have left the labour force, technically speaking. In other words, the labour force represents the total manpower readily available to the economy. It also follows, from what has just been said, that an inactive person, whether she has or not worked before, who decides to work but cannot get a job, enters the labour force when she starts to seek employment actively and stays among the unemployed for as long as she is looking for work.

As can be seen from Table 1, there has been a tremendous increase in the female labour force in Canada since World-War II: it has more than doubled, going from an average of nearly 1.1 mil-

(1) Hereafter, whenever we speak of the labour force we mean the civilian labour force.

(2) In 1967, an average of 18.2% of all employed women were working less than 25 hours per week as against only 5.5% of all employed males.

lion women in 1947 to over 2.3 millions in 1967. During the same period, the male labour force only increased by about one-third. What is even more interesting is the fact that the larger part of this 1.2 million increase in the female labour force took place since 1958; the increase was around 400,000 between 1947 and 1957 while it came to more than 800,000 in the following ten years. By contrast, the increase of roughly 1.4 millions in the male labour force is divided evenly between the two ten-year periods. Table 2 gives the average level of employment for each year since 1947. It can be seen that female employment increased as much as did female labour force, also doubling since 1947, and that, like the latter, it increased twice as much from 1957 to 1967 as it had in the preceding ten-year period. For male employment, the picture is quite similar to that of the male labour force, having increased by nearly 600,000 from 1947 to 1957 and by about 800,000 from 1958 to 1967. But male employment actually increased by approximately 100,000 less than the male labour force for the whole of the period extending from 1947 to 1967, with the inevitable result that the number of unemployed males in 1967 was substantially higher than in 1947, in absolute terms. (1)

Table 3 shows the behaviour of male and female participation rates during the past twenty years. The labour force participation rate of a group (an age group, sex group, marital status group, etc...) is defined as the proportion of all persons of 14 years of age and over in that group who are in the labour force. In other words, it is the number of persons of working age (14 years and over) working or actively seeking work expressed as a percent of the total number of persons of working age who constitute a given group.

As can be seen from Table 3, the male participation rate has been declining while, on the other hand, the female participation

(1) See Figures 1 to 4.

rate has been increasing. The labour force participation rate is evidently the most important variable for the projection of the 1980 labour force since the working age population can be easily predicted for that year, all of those who will be 14 years and over in 1980 being already born (only net immigration is an uncertain factor). The major part of our task, therefore, consists of predicting the 1980 participation rate for each of the specified groups for which we want to know the labour force level.

The declining participation rate for males since 1947 can be ascribed mostly to increasing school enrolment rates among teenagers and young men; as time passed, fewer adolescents tended to leave high school prematurely to enter the labour force, while university enrolment grew considerably. The very rapid decline in the participation rate for men of 65 years and over also contributed to the decrease in the overall participation rate for males. However, because

(a) teenage school enrolment rates are approaching their maximum levels and, (b) the participation rate for elderly men is not expected to decline much more, it is highly probable that, as the Economic Council has predicted, there will be practically no change in the total male participation rate from now to 1980.⁽¹⁾ This means that the male labour force can easily be predicted for that year. Unfortunately, the outlook is different for female labour force participation rates.

The most striking feature of the increase in the total female participation rate is the fact that it entirely took place since 1956; the rate remained constant, on the average, until 1956, after its decline at the end of the War years. The increase in the overall female participation rate since 1956 was due primarily to sharp increases in the participation rates of women aged between 25

(1) Cf. Staff Study No. 19, E.C.C., Sept. 1967.

and 64 years; since the participation rate for single women did not change appreciably, this can be ascribed to a massive entry of married women in the labour force, that is, to a considerable increase in the proportion of all married women who are in the labour force. The participation rate for women aged 20 to 24 years and that for women of 65 years and over increased slightly, thus contributing to raise the overall rate. The participation rate for teenage girls was the only one that declined and, as for teenage boys, increased high school enrolment rates were the main influence. Table 15 shows the evolution of female participation rates for the different age groups since 1950.(1)

The impact of an increasing female participation rate on the total number of women in the labour force can be measured by the fact that one-half of the 1.3 million increase in the female labour force since 1947 is accounted for by the rise of the participation rate from 24.1% to 33.8% in 1967. The growth in the share of women in the total labour force and in total employment in the economy is illustrated by Table 4. This increasing importance of women in the economy stems directly from the fact that female labour force and employment have grown twice as much as male labour force and employment since 1947.

Employment Growth and Unemployment

Tables 5 and 6 show the annual rate of change of employment in Canada and the United States, respectively, since 1948 (1947 for Canada), for males, females and both sexes. Firstly, it can be seen that female employment grew faster than male employment in both countries practically every year. Secondly, a

(1) See also Figures 5 to 26.

striking difference between the two countries appears with respect to the behaviour through time of the female employment growth rate. In Canada, the annual rate of change of female employment surged upward in 1956 and, except for 1958, it remained higher than for any year in the 1947-56 period. In the United States, there was no comparable pattern; the average annual rate of change of female employment is the same for both the 1948-55 and 1956-66 periods. The third point to underline is the tremendous rate of growth that female employment maintained in Canada during the period of general economic stagnation running from 1957 to 1961: while male employment grew at an average annual rate of 0.5%, the average annual rate of growth of female employment was 4.8%. This clearly suggests that women are employed mostly in those sectors of the economy which are not too severely affected by the stagnation of the total economy. This fact is even more substantiated by what happened in 1960: male employment merely increased at all while employment of females grew by 6.0%. And it is, of course, because women workers are found mostly in what are technically called "non-cyclical sectors" of the economy that total female employment went on increasing during the recession years of 1954 and 1958 while the total number of males at work actually declined. A close examination of Table 7 reveals that, although the rate of growth of female employment generally increases when the rate of growth of the total economy⁽¹⁾ increases, and declines when the latter declines, it is much less correlated with the economy's growth rate than is the rate of change of male employment. In some cases, increase in female employment remained quite constant while the growth of the economy surged upward or declined sharply, and at other

(1) Gross National Product, which is the economy's total output of goods and services.

times, it increased while the expansion of the economy slowed down substantially. An attempt to fit a regression of the rate of change of female employment on the rate of growth of Gross National Product, using quarterly data from 1953 to 1967, produced no significant results; no evidence of correlation was found between variations in female employment and variations in the total output of the economy. This does not mean that the level or the size of the change in general economic activity has no influence whatsoever on female employment; the data of Table 7 show that, on an annual basis, employment for females is, to a certain extent, affected by the general state of the economy. But it does suggest, however, that changes in the demand for female labour are, in the short-run, largely independent of the rate of growth of the whole economy.

Perhaps the most remarkable feature of the entire post-war period is the fact that women workers, seen as a group, have been fully-employed. Except for three years where the unemployment rate⁽¹⁾ for females was such as to indicate that there was "a little" unemployment among women workers, the rate has remained slightly over, at, or below the 3.0% mark considered to represent a state of full-employment, for each year since World-War II. Table 8 shows unemployment rates by sex for Canada and Table 9 gives comparable data for the United States. While women have enjoyed a condition of continuous full-employment since the War, the same cannot be said for male workers whose unemployment rate was near 3.0% for only a few years during that period. In fact, if the last fifteen years or so are considered, it is interesting to note that, even during periods of very rapid economic growth such as 1955-56 and 1964-66, the unemployment rate for men was not brought down to the full-employment (3%)

(1) The unemployment rate is defined as the unemployed as a percent of the labour force to which they belong.

level. In the United States, the situation is considerably different : as shown in Table 9, the female unemployment rate has been and is still higher than the rate for men. Furthermore, contrary to the state of full-employment of female labour that has prevailed in Canada, women workers in the United States have been plagued consistently by substantial unemployment for the past twenty years, except for the period of the Korean - War boom (1952-53).

Behaviour of the Participation Rate

Table 10 gives, for both Canada and the United States, the female labour force participation rate and the rate of change of female employment for every year since 1948. The dissimilarity in the experience of the two countries with respect to those variables appears readily upon examination of Table 10. For the United States, the participation rate is seen to be increasing constantly throughout the entire period and the rate of growth of employment, albeit very unstable from one year to the other, does not appear to have changed markedly with time. As for Canada, the pattern followed by these two variables did change substantially with time. It can be seen that the participation rate started to increase only in 1956, after it had remained at more or less the same level for eight years, and that employment started to grow much more rapidly, on the average, also in 1956. Table 11 shows, in terms of growth rates, what happened in Canada and the United States. From these data, it seems reasonable to suggest that the rate of growth of employment has had a significant influence on the growth of the participation rate, especially so in Canada. This proposition is graphically illustrated in Figure 5: the long-term acceleration that took place in the number of employed females is accompanied by a simultaneous

acceleration in the absolute level of the participation rate.

The reason for believing that the rate of growth of employment influences the participation rate is very straightforward and takes on two interrelated aspects. First of all, it has to be remembered that employment of women is, for all practical purposes, equivalent to the demand for women workers and, consequently, the rate of growth of female employment can be considered as the rate of growth of the demand for female labour. It then follows, as a matter of common sense, that given the psychological, sociological and financial motives which make more and more women want to work outside their home, the faster the demand for female workers increases (the faster female employment increases), the more numerous are job opportunities for women and the larger is the number of women who will be attracted to the labour force. Hence, the observed correlation between the rate of growth of employment and that of the participation rate. In other words, even if more and more women express the desire to work, it is probable that few of them would actively seek employment if, for example, the total number of jobs opened to women increased no faster than the female population of 14 years and over; this seems to be what has happened in Canada from the end of the Second World-War to the mid-fifties and we believe that the female participation rate remained constant during that period mainly because job opportunities for women grew too slowly. However, it has been suggested by a few labour economists that it was not the rapid growth in female employment which pulled upward the female participation rate but rather that it was the increase in the latter which was accountable for the increase in the rate of growth of female employment. Those who support this proposition argue that there was an autonomous increase in the participation rate of women, due to socio-psychological reasons that have the effect of inducing

women to seek employment outside their home, and that this increased the supply of "cheap labour" on the labour market, female wages being usually lower than male wages. Under such circumstances, employers seized the opportunity offered them to replace men workers by less costly women workers as much as possible; the fact that the male unemployment rate maintains itself at a much higher level since the female participation rate started to increase in the mid-fifties is presented as a strong indication of this male-female substitution phenomenon.

We do not subscribe to this argument because it seems to us that socio-psychological factors could not have operated in such a way as to make, all of a sudden in 1956, the participation rate start climbing sharply, as has actually happened. On the contrary, socio-psychological factors tend to make themselves felt rather slowly and smoothly, not suddenly. However, it is perfectly normal to expect that economic factors can produce an extremely large increase in the rate of growth of the demand for female workers from one year to the next, inducing as a result a strong increase in the participation rate, and that if the higher rate of growth of the demand for female labour persists, the participation rate will go on increasing rapidly. As a matter of fact, the growth rate of female employment jumped from 3.1% in 1955 to 6.8% in 1956 and stayed at a higher level, on the average, than in the preceding years.⁽¹⁾ As for the fact that the volume of male unemployment is considerably larger since the female participation rate started its rapid climb in 1956, it gives only weak support to the male-female employment substitution theory since the volume of female unemployment also increased during the same period and is also larger than it was previously, since 1956. The explanation for the increased volume of unemployment since the mid-fifties is simply that

(1) Cf. Ostry and Meltz, op. cit. for possible explanations of new trends in female employment.

the economy's rate of growth was not high enough relatively to the rate of growth of the population of working age.

Another aspect of the correlation between the growth of the participation rate and the rate of growth of female employment is that, given the growth rate of the population of working age, any increase of employment above that rate must necessarily mean lower unemployment and/or increased participation to the labour force. If there happens to be very little unemployment, as was the case for Canadian female workers in the past twenty years, high rates of growth of employment automatically entail sharp increases in the participation rate. Thus, it can be seen that the rate of growth of female employment has a double connection with the participation rate. From a human behavioural point of view, the faster the growth of the demand for female labour, the larger the number of women who will be induced to enter the labour force. From a purely numerical or mechanical point of view, the faster the growth of female employment, the larger the number of women who must necessarily have entered the labour force (given the increase in the population). From what has been discussed in the last few paragraphs, it can be easily inferred that the rate of growth of employment turns out to be a key variable for short-term predictions of participation rates. Even though we recognize that it is social factors which explain why an ever-increasing proportion of all women of working age want to work outside their home, we insist strongly on the importance of the rate of growth of female employment because, insofar as it is equivalent to the actual demand for female labour, it is the permissive factor for the growth of the participation rate. Women would not enter the labour force in such vast numbers if job opportunities were not expanding. In 1963, the United States Department of Labor conducted a survey⁽¹⁾ which showed that 1.5% of all women who were

(1) Special Labor Force Report No.48, Bureau of Labor Statistics, U.S. Department of Labor, Washington D.C., U.S.A.

not in the labour force (550,000 of a total of 36.4 millions) said that they wanted to work but that the general lack of job opportunities made it a waste of time to actively seek employment. In Canada, this 1.5% would have represented 45,000 women in 1963.

Female Employment in the Different Sectors of the Economy

Table 12-A shows that women constituted 31.1% of all employed workers in 1967. It is interesting to note that they constituted 41.3% of all workers in the service-producing sectors and also that there are more women than men in services of all kinds (60.5%). Of more interest from our point of view is Table 13. It can be seen that 78.5% of all women who worked in 1967 were in the service-producing sectors and that nearly half (45.6%) of all women workers were in service industries as such. Table 14-A shows that more than two-thirds (67.8%) of all office workers in 1967 were women while it can be seen from Table 14-B that more than half of all female workers were either office or service workers.

The fact that more than three-quarters of all working women are concentrated in the service-producing sectors, and constitute over two-thirds of all office workers, goes a long way towards explaining the fast growth of female employment in the last decade, and also the fact that this growth went on unabated during general economic recession periods. Firstly, it is well known that, in the goods-producing industries, the importance of office work relative to production work (what might be called "in-plant work") is increasing. This means that even when the output of goods is not increasing, employment of office workers tends to go on growing, although at a slower pace than when output is expanding; when the latter situation prevails, employment of production workers increases and that of office workers tends to grow at a very rapid pace. It then follows that, because women make up

about two-thirds of all office workers, female employment will necessarily tend to increase, on the average, at a very fast rate, office work being an occupational group which generally grows rapidly.

The second explanation, probably the most important, for the fast rate of growth of female employment lies in the fact that more than three-quarters of all employed women work in the sectors of the economy where productivity grows relatively slowly and where, therefore, any given increase in production calls forth a relatively large increase in employment. Contrary to a widespread belief, service-producing industries do not generate a large amount of jobs because they are the fastest growing in the economy, but rather they do so because productivity in these industries does not increase rapidly. As a matter of fact, Table 12-B shows that goods-producing industries have been growing faster than service-producing industries⁽¹⁾ in the past twenty years. But the fact that the rate of growth of productivity in the former is more than twice as high as what it is in the service-producing industries explains why services create much more employment than goods-producing industries do. Females working mostly in services, private or public, it is highly probable that female employment will go on increasing rapidly in the future, except if productivity growth increases significantly and/or the growth of services production slows down appreciably.

A corollary to what has been discussed is that, since women work mostly in industries where the growth of productivity is lower than the average for the whole economy, their earnings should tend to

(1) The data of Table 12-B refer only to private service-producing industries but it is quite probable that the rate of growth of productivity in public service-producing industries is very close to that of private service-producing industries.

grow at a slower pace than the average earnings for all employed persons. In fact, between 1951 and 1961, the average annual earnings for female workers increased by 63.3% while the average annual earnings for all workers (both sexes) increased by 70.4%. (1) If pertinent data had been available, it would have been possible to see whether or not female earnings grew more slowly because their productivity did so, or simply due to the fact that in 1961 proportionately more women worked part-time, relatively to men, than was the case in 1951.

(1) Data obtained through the Department of Manpower and Immigration, Ottawa.

SECTION IITHE FEMALE LABOUR FORCE IN 1980

This section constitutes an important portion of this study since it contains various female labour force projections obtained through regression analysis. The Economic Council of Canada had partly made similar projections for 1980 by qualified extrapolations of past trends. We feel that our econometric approach will yield different results, although we do not wish to claim that our method will give "better" results. (1)

We shall first discuss the question of projecting the 1980 working age female population; secondly, our female labour force projections will be presented and discussed at length.

THE FEMALE POPULATION IN 1980

Since all persons who will be in the population of working age (14 years and over) in 1980 are already born, the problem of projecting the female population of working age for 1980 seems relatively easy, at first glance. By following age cohorts and applying mortality rates to them, it is possible to arrive at a very accurate estimate of the 1980 working age population. However, there is the delicate question of net immigration. In a country like Canada, it is impossible to omit considering population movements in and out of the country because net immigration has had an important influence on changes in the Canadian labour force, practically every year, since the Second World-War. While the volume of emigration has not fluctuated substantially in that period, the total number of immigrants has shown wide variations from year to year, as can be seen from Table 16. The result is that net immigration can swing from nearly zero, as in 1962, to nearly 100,000 four years later (1966). It thus becomes evident that one or more mean annual net immigration assumptions have to be made in order to estimate the 1980 population of working age; this is the main source of population projection error.

(1) Cf. Staff Study No. 19, op. cit., pp. 1-3.

In the labour force projections it made for 1980 (1), the Economic Council of Canada, recognizing the fact that the volume of net immigration has been extremely volatile during the past twenty years, used three assumptions in that respect : a "low" annual-volume of 20,000 net immigrants, a "medium" number of 70,000 and a "high" one of 120,000. Each of these assumptions yielded a corresponding population for 1980, as shown in Table 17. For our part, we believe that a net annual inflow of 120,000 migrants between now and 1980 is highly improbable. For one thing, Canada is not likely to attract that many foreigners; unemployment in Europe is relatively small, employment opportunities tend to be plentiful and the gap in the standard of living between Canada and Europe is becoming smaller. In other words, the situation in Europe, relatively to Canada, is much less conducive to large scale immigration into this country than it was in the 1950's. As for the exceptionally large number of net migrants into Canada in 1966 and 67, it was probably due to a set of circumstances that is not likely to prevail each and every year until 1980 : unemployment was relatively very low in Canada while it was increasing rapidly in Europe due to an economic recession or stagnation in most countries. A net annual inflow of 20,000 migrants does seem to be rather small when Canada's record on this account is considered, but a situation of economic stagnation and high unemployment in Canada, combined with rapid growth and full-employment in Europe, could easily reduce net immigration to around 20,000; as a matter of fact, this is what happened in the early sixties. However, because Canada is not likely to suffer again a prolonged period of slow growth and massive unemployment as it did from 1958 to 1963, an inflow of only 20,000 net migrants is probably an extreme estimate, biased on the low side. But we might add that if we had to choose between the 120,000 annual net migrants and the latter, we would choose 20,000 as a more realistic figure.

(1) Staff Study No. 19.

All things considered, we think that the Economic Council's "medium" assumption constitutes the best approximation as to the probable volume of net immigration in the years to come. A projected annual net inflow of 70,000 seems appropriate, especially in view of the fact that the volume of emigration to the United States could be seriously reduced by new regulations that the Government of that Country intends to apply to immigration from Canada. In making our own labour force projections, we shall use each of the three sets of the Economic Council's population estimates, although, as was said above, we feel that the estimates based on the 70,000 net immigration assumption are the most reliable ones.

As far as Canada's main regions are concerned, accurate estimates for the 1980 population are even more difficult to make since, in addition to net immigration from other countries into each of them, they must include estimates of net migration between the regions themselves. Given these difficulties, we thought that probably the best procedure was to make simple linear extrapolations of each region's share of the total Canadian female population aged 14 years and over for 1980. As can be seen in Table 18, the stability of each region's share of the total, at least since 1950, seems to warrant our adoption of such a simple procedure. We think that the possible error cannot be large, at any rate. Table 19 gives the population estimates for each region for 1980; they were obtained by applying each region's projected share for 1980 to the projected total Canadian female population of working age for that year. It can be seen that the Economic Council's three assumptions on annual net immigration were used.

PROJECTIONS OF PARTICIPATION RATES

Data presently available in Canada permitted us to make "predictions" for only three different sets of female labour force participation rates: by age group, by marital status group and by economic region in Canada. The relative lack of data on participation rates is illustrated by the fact that, for Canada as a whole, time-series on participation rates by marital status group begin with the first quarter of 1959.

As mentioned earlier, an econometric approach was used to forecast the different 1980 female labour force participation rates. Before proceeding any further, however, it should be pointed out that another attempt, well known to labour economists, which used econometric methods to obtain long-term predictions of participation rates showed much poorer results than the method of "qualified linear extrapolation" usually used to predict participation rates. (1) However, as will be seen shortly, our predictions appear to be satisfactory. This is probably due to the fact that we have used a quite different econometric approach than that of Dernberg, Strand and Dukler.

THE REGRESSION MODEL USED

The model which we have used to predict the 1980 female labour force participation rates can be described as a series of linear relationships between specific dependent or "explained variables", the participation rates, and a certain number of

(1) Cf. Dernberg, T., Strand, K. and Dukler, J., "A Parametric Approach to Labor Force Projection", Industrial Relations, Vol. 6, October 1966. See also Cooper, S. and Johnston, D.F., "Comments on the Dernberg, Strand, Dukler Approach", *idem*.

"explanatory variables". (1) For example, we tried to explain the evolution of the participation rate for single women by the rate of change

(1) We postulated the following model:

$$FPR_{it} = a_0 + a_1 \left[\frac{\Delta FE}{FE} \right]_{jt} + a_2 t + a_3 (MPR)_{jt} + a_4 \left[\frac{\Delta MPR}{MPR} \right]_{jt} + u_t$$

with a disturbance (u) following a first-order scheme

$$u_t = \rho u_{t-1} + \epsilon_t \quad \text{and where:}$$

- FPR_{it} = female participation rate (%) of a given group (i) at time (t). A group (i) means either an age group, a given marital status or a given economic region in Canada.
- $a_{0, \dots, 4}$ = parameters (or coefficients) of the linear equation which are to be estimated by regression analysis.
- $\left[\frac{\Delta FE}{FE} \right]_{jt}$ = percentage variation (Δ) in total female employment (FE) for a given group (j) between time (t-1) and time (t). A group (j) means either Canada or one of its five economic regions.
- t = time period (quarter or year) with the first period denoted by 1, the second by 2, and so forth.
- $(MPR)_{jt}$ = total male participation rate (%) for a given group (j) at time t. A group (j) means either Canada or one of its five economic regions.
- $\left[\frac{\Delta MPR}{MPR} \right]_{jt}$ = percentage variation (Δ) in total male participation rate for a given group (j) between time (t-1) and time (t). A group (j) means either Canada or one of its five economic regions.
- u_t = autocorrelated disturbance at time t.
- ϵ_t = autocorrelation - free disturbance at time t.
- u_{t-1} = disturbance at time (t-1).
- ρ = autocorrelation coefficient (Rho); absolute value smaller than one.

of female employment, time (which is a proxy for factors influencing the participation rate smoothly over time), the total male participation rate and the rate of change of the total male participation rate. A similar regression was fitted, although with an additional explanatory variable in a few cases, for married women, "other women" (widowed, divorced or separated), each of the main age groups and each of the country's five economic regions.

THE EXPLANATORY VARIABLES

We shall now discuss the reasons that brought us to use the above-mentioned variables in the regression model. It should be pointed out here that other variables were studied very closely from the point of view of their possible "influence" on the participation rate but appeared uncorrelated with the latter.

The first explanatory variable is the rate of change of female employment which, for all practical purposes, can be considered as the demand for female labour. It was explained, in Section I, that the more rapid the growth of demand for women workers is, the greater is the number of job opportunities being created and the stronger is the inducement for women to enter the labour force given the factors that make more and more of them want to work outside their home. As far as the projections for 1980 are concerned, the point to underline here is that if the rate of change of female employment (or of the demand for female labour) has a significant influence on a particular participation rate, the higher will be the latter in 1980 the faster the growth of female employment at that time. Even though we cannot predict accurately what the rate of growth of female employment will be in 1980, it is obvious that any projected participation rate will differ from what it would be if no account was taken of the possible influence of this variable.

For the sake of completeness, the following remark might be added to the discussion. All the studies on participation rates that we know of (1) used some measure of unemployment as an explanatory variable. They used either the unemployment rate as such, or the absolute volume of unemployment, or the rate of change in the latter, or what is called the "unemployment-population ratio" which is simply the ratio of the total number of unemployed persons on the total population of working age. Like ours, the studies we are referring to, took account of the fact that "employment conditions" (or the number of job opportunities) influence the participation rate (in the aggregate at least) and a measure of unemployment was thought to reflect adequately the state of the market for jobs. There are two comments to be made concerning what has just been outlined. Firstly, in certain cases, the use of the unemployment rate or the unemployment-population ratio may give rise to some serious econometric problems. (2) Secondly, and most importantly, this procedure, while probably suited to the study of male participation rates, did not seem to be in the case of female participation rates. This is so because female unemployment has been practically inexistant in Canada for the past twenty years. Furthermore, it might be added that unemployment is not as good an indicator of employment conditions as it appears at first thought. A low unemployment rate might not necessarily mean that job opportunities are numerous since it is possible that employment is growing no faster than the increase in the labour force due to population growth; such a situation would probably not be conducive to any significant increase in the participation rate. Hence, at least for female participation rates in Canada, the rate of change of female employment was found to be the best indicator of employment conditions.

(1) Cf. Dernberg et al., op. cit., pp. 46-78, for references.

(2) The same variable appearing on both sides of an equation, as numerator or denominator to a different rate variable.

The second explanatory variable used is time. From the point of view of projecting participation rates for 1980, time turns out to be by far the most important variable. When time itself is said to be a variable influencing the participation rate, it is meant that time is a proxy for all the other factors (or variables) which contribute to explain the behaviour of the participation rate but cannot be measured or arranged in such a form so as to make their inclusion in a regression model possible. These factors can be psychological, social or even economic in character. And they are all thought of as operating rather smoothly over time on participation rates. In other words, it is assumed that, in addition to being possibly influenced by the variables included in the regression model, the participation rate changes with time under the influence of variables (or factors) not included as such in the model (besides the disturbance).

In Section I of the present study, we mentioned briefly some of the factors, other than the growth of employment opportunities, which tend to induce women to enter the labour market. As a matter of fact, the existence of numerous employment opportunities can be thought of as the permissive factor which makes it possible for the desire that women have to work outside their home to be translated into actual entry in the labour force. The social, psychological and economic factors for which time is a proxy are the ones that explain the fact that an ever-increasing proportion of all women of working age want to work outside their home. These are factors like the dissatisfaction more and more women feel with their staying at home now that so many household tasks are "mechanized"; the pressures towards the acquisition of highly priced goods and services which are felt both on an individual and family basis; the fact that a large number of relatively high-paying office and service jobs are available compared to the days when most jobs opened to women were in low-earning sectors

like retail trade and labour-intensive manufacturing industries; the fact that the present generation of women is in a better position, from an educational point of view, to fill jobs that are more interesting and appealing (from whatever point of view) than factory work or counter selling in a store; the desire of today's women to "participate to society" which, for more and more women, can only be satisfied, according to many sociologists, by outside work, etc... Obviously, many of these factors are intermingled with each other. The contention here is not that those factors make for an increase in participation rates because they are or will be increasing in intensity or importance. It is rather that the above-mentioned factors are influencing (or "touching") a proportion of all working age women which has been and is increasing, and which will probably be increasing for some time in the future. In other words, the time variable in the regression model stands for the fact that an ever-increasing proportion of women become influenced by those factors. (1)

We have included in the regression model, as special cases, as many of those factors working smoothly over time as were available in a form suited to the purpose of mathematical analysis. Thus, for women aged 14 to 19 years, we added the school enrolment rate as an explanatory variable; for the 20-24 age group, we added the fertility rate; for the total (all ages) group, we included the rate of change of the total value of consumer credit outstanding. Another variable we thought of including in the model was a measure of the rate of growth of female wage rates (as opposed to average earnings) relatively to that of male wage rates. Unfortunately, except for manufacturing, the only available data were average earnings for census years; therefore, we could not introduce such a variable in the model.

(1) Examination of scattergrams did not indicate that the variable time-squared ought to be included in the model.

However, it should be pointed out that this type of variable tends to create serious difficulties, from the point of view of econometrics, since its value is usually increasing quite steadily with time and, as a consequence, is strongly correlated with the time variable or with other variables of the same type. (1)

The total participation rate for males was included as an explanatory variable in the model. Both its absolute value and its rate of change were used. This was done because it was felt that these two variables might be considered proxies for factors which are not "covered" by the other two variables. Firstly, although the male participation rate was on a downward trend for the whole period studied, it either actually increased or its rate of decline diminished sharply during periods of booming economic activity. It is possible to conceive that the economic climate itself surrounding an economic boom could make many persons (women in this case) enter the labour force quite independently of the actual employment situation, so that the overall effect could be a larger increase in the participation rate than the one which the actual increase in the number of job opportunities would warrant. This view is somewhat supported by the fact that the female unemployment rate has tended to decrease much less than the male unemployment rate during certain periods of strong economic expansion. In other words, the female participation rate could tend to over-react to the rate of change of employment and, as far as the rate of change of the male participation rate reflects the general economic situation prevailing at any one time, it was included in the model as a variable to explain this over-reaction.

The fact that the total male participation rate has been decreasing for the past twenty years necessarily implies that the total male labour force has been growing at a slower pace than has the male population of working age.

(1) This is the regression problem called "multicollinearity".

Given the overall demand for labour in the economy and also the fact that female employment has increased extremely rapidly (since the mid-fifties), one tends to conclude that the fast growth of female employment was due in large part to the slow growth of the male labour force. The contention would be that employers faced a shortage of male workers, whose number was not increasing as fast as the demand for them, and that they tackled the problem by simply substituting women for the missing male workers; this would have had the effect of adding an additional demand for women workers on top of the "usual demand" for them, and so, of producing the tremendous growth in total female employment. This hypothesis is given extra support by the fact that, in the mid-fifties, an acceleration in the rate of decline of the male participation rate has in fact coincided with an acceleration in the rate of growth of female employment; both variables have been changing more rapidly since then as compared to the previous ten years.

However, there are good reasons for doubting that this explanation is correct. Firstly, the volume of male unemployment has been considerably larger ever since female employment started to grow at an extremely fast rate, a fact which casts some doubts on the hypothetical existence of a shortage of male workers. Secondly, the male participation rate had been declining, although at a slower rate than it has later on, from the Post-War days to the mid-fifties, a period which saw only a "moderate" growth of female employment. Nevertheless, we included the male participation rate as an explanatory variable in the model because, even though we have strong doubts to this effect, we cannot be absolutely certain that the decline in the male participation rate does not explain why female employment has grown so rapidly since 1956. Statistically, it is impossible to reject without evidence the hypothesis that the decline in the male participation rate

has added an additional part to the "usual" demand for female labour. Furthermore, the inclusion of the male participation rate in the prediction model was all the more important since, if the hypothesis happens to be well founded in reality, our predictions would be invalidated by the fact that it is highly probable that the male participation rate will not decline anymore in the future. This is so because the validity of our predictions rests upon the assumption that the demand for female labour (female employment) will go on increasing at the very fast rate it has maintained since the mid-fifties. What is meant here is that there has to be in the model a variable to take into account the possible influence of the decline in the male participation rate on the behaviour of female participation rates.

Summing up, the following hypotheses will be tested by submitting our general model to regression analysis:

(a) positive relationship between the various female labour force participation rates and

1-the rate of change in female employment, (or in Gross National Product, for age groups);

2-time;

3-the rate of change in the total male participation rate;

(b) no relationship between the various female labour force participation rates and the total male participation rate;

(c) 14-17 (age group) school enrolment rate and 20-24 fertility rate negatively correlated with their "respective" female participation rates (14-19 and 20-24);

(d) rate of change in consumer credit outstanding positively linked with total female labour force participation rate;

(e) positively autocorrelated disturbances (first-order autoregressive scheme).

PROJECTION RESULTS

Table 23 to Table 29 provide information pertaining to the regressions which have been fitted; they also give United States data on female participation rates by age group and marital status. (1) Table 30 to Table 34 present the final results of this section, the projections themselves. Tables 20, 21 and 22 show intermediate results, that is, projections of participation rates for 1980 and the numerical results of the regressions used to obtain them. Table 34 provides a summary for comparison purposes.

Table 20 shows the obtained coefficients of the different variables used in the regressions: the rate of change of total female employment ($\Delta FE/FE$), time, the total male participation rate (MPR), the rate of change of the total male participation rate ($\Delta MPR/MPR$), the dummy variable (2nd quarter), the secondary school enrolment rate (SER), the fertility rate for women aged 20 to 24 years (FR) and the rate of change of total consumer credit outstanding ($\Delta CC/CC$).

Table 20 also shows the multiple correlation coefficient (R) of each regression equation and the coefficient of serial correlation between residuals (Rho). In general, the higher the value of R, the better the fit, and the higher the value of Rho, the more serious the serial correlation; the latter has been taken explicitly into account by an appropriate estimation method. Details about the econometric method used are given in appendix to this report.

The last two columns of Table 21 contain the original and revised projections of participation rates for 1980, while the rest of the table shows the 1980 values of the independent (or explanatory) variables used to make the projections. It should be pointed out that, except for time, these 1980 values are themselves projections that were made by "qualified simple extrapolation", either by us or by the Economic Council of Canada.

(1) See also the various corresponding Figures given at the end of this report (and showing scattergrams and regression lines).

Table 22 shows the two slightly different models that were tried in order to project for the age groups. Table 22-A deals with age sub-groups.

The regional and time basis on which the data were used are given between parentheses, in each of these three tables. A dash indicates that the variable mentioned at the top of the column does not apply to the case of a particular age, regional or marital status group.

Since slightly different original results were obtained for the total, age, regional and marital status groups, it was necessary to correct them so that they would be consistent with each other. The regional results served as a bench-mark for the revision because their multiple correlation coefficients (R) were the highest ones. Each of the other results were adjusted proportionately to the difference between 44.6% (the weighted total for the combined regions) and either 47.1% (for the combined marital status groups) or 44.1% (for the combined age groups) or 45.5% (for the 14-+ female population). The weights used were those shown in the first numerical column of Table 21, the (projected) population distribution (%) in 1980.

Before going on with the discussion of the results in detail, it should be strongly emphasized again that the validity of our predictions rests upon the (plausible but not absolutely certain) assumption that total female employment will, on the average, continue to grow as rapidly as it did previously, from now until 1980.

Marital Status, Canada

Data on participation rates by marital status not being seasonally adjusted, it was necessary to include "dummy variables" (0,1) in the model. These are used to take into account the fact that the dependent variable (in this case the participation rate) is not corrected for seasonality while the explanatory variables are. Since quarterly data were used and since we chose the second quarter of 1980 as our prediction date, the coefficient of the second quarter dummy variable appears in Table 20, for each of the three sub-groups. Table 21 shows "1.0" for both the "dummy" and "constant" variables 1980 level.

Having used the past average as a predictor, we obtained a quarterly rate of increase in total female employment of 1.3% in 1980. We chose the total male participation rate to be 77.7% (the E.C.C. 1980 projection). The time period for the second quarter of 1980 is 86.0.

a) Single Women

From Table 20 it can be seen that the rate of growth of employment, time, the male participation rate and the dummy variable all had a significant influence on the participation rate for single women while the rate of change of the male participation rate was found to have no significant "effect" on it. The unrevised projected participation rate for 1980 (second quarter, more precisely) is 58.7%; the revised rate is 55.5% (see Table 21).

b) Married Women

Table 20 shows that only time, the rate of growth of female employment and the dummy variable have had a significant influence on the participation rate for married women during the period (1959-67) covered by the regression model. The original projected participation rate for 1980 (second quarter) is 44.6%; the revised rate is 42.2% (see Table 21).

c) Other Women (Separated, Divorced or Widowed)

As can be seen from Table 20, only time and the dummy variable have had a significant "effect" on the behaviour of the participation rate for women who are neither married nor single. The 1980 (second quarter) unrevised projected participation rate is 30.8%; the revised rate is 29.2% (see Table 21).

The sharp increase projected in the participation rate for married women (from 28.3% in 1967 to 42.2% in 1980) should come as no surprise since it is a fact that married women are the ones who have been entering the labour market in a somewhat astonishingly large number since the mid-fifties. Of course, as stated earlier, the validity of our projections rests upon the assumption that the factors which make for that phenomenon will be present at least until 1980.

Compared to married women, only a small increase is projected in the participation rate for "other women". The fact that the latter has been, and is projected to be, relatively stable is probably due to the fact that an important share of all those "other women" consists of older women who are widows and who therefore cannot or do not need to work. Indeed, data show that widows tend to be relatively aged and also that relatively aged women tend to have a low and stable participation rate (as can be seen from data on the 65 years and over age group).

Perhaps the most surprising result is the large projected increase in the participation rate for single women, a rate which has been quite stable from 1959 to 1967. The purely mathematical explanation of this fact runs along the following lines. It can be seen from Table 20 that the coefficient of the male participation rate variable has a positive sign.⁽¹⁾ This means that this variable tended to pull downward the participation rate for single women, since the male participation rate declined rapidly from 1959 to 1967 (a tendency which was actually more or less exactly counterbalanced by the influence of the other two variables in the model). Then, since we assume that the male participation rate will remain constant until 1980, it follows that the participation rate for single women will be submitted only to the active influence of variables (time and the growth of employment) which tend to make for an increase in its value. Now, we could tentatively suggest the following non-mathematical explanation. A large part of all single women is made up of teenage girls. On the other hand, the sharp decline in the male participation rate was in good part due to the fact that the school enrolment rate for teenage boys (the number of teenage boys enrolled in a school as a percentage of all teenage boys) has been increasing. In part because the latter is approaching its maximum value, it is expected that the total male participation will not decline anymore. This means that the male participation rate could be considered as a proxy for the school enrolment rate for teenage boys, at least in the context of the particular regression dealing with single

(1) We were expecting a null or negative coefficient.

women. Furthermore, it could also be considered as a proxy for the school enrolment rate for teenage girls. (1) But it should be strongly emphasized that it would be an imperfect proxy because, while the male participation rate will be stable (if the projection is correct) from now to 1980, school enrolment rates will still be increasing, although at a much slower rate than previously, thus tending to go on depressing participation rates for teenagers. In other words, all this is equivalent to saying that the tendency towards increased schooling for teenage girls will not be as important a factor as before in preventing the participation rate for single women from increasing, because the school enrolment rate is not expected to increase as fast as it did from 1959 to 1967.

It is of course quite possible that our prediction for single women is too high, given the fact that the male participation rate is only an imperfect proxy for the school enrolment rate of teenage girls. (2) But there are two reasons for believing that the participation rate for single women will increase from now to 1980. The first one is that we are projecting an increase in the participation rate for teenage girls, most of whom are single; this rate was declining in the past and thus it was exerting a downward pull on the total participation rate for single women. The second one is that the participation rate for single women aged 20 years and over will certainly increase under the influence of the psychological, social and economic factors discussed earlier. In any case, this projection has been revised downward to reconcile the three marital status projections with those for the regions and the age groups. As can be seen from Table 21, our revised projection

(1) The simple correlation coefficient between the total male participation rate and the secondary school enrolment rate (number of persons at secondary school as a percent of all persons aged 14 to 17 years) is - 0.978. This negative linear correlation means that, from 1959 to 1967, while the male participation rate was decreasing, the secondary school enrolment rate was increasing.

(2) Table 39 indicates a "standard relative error" of 4.4%.

for single women is 55.5%. A cross-check projection was made for 1980 using our projected rate for women aged 14-19 years and a rather conser-
vative estimate of the participation rate for single women aged 20 years and over; we obtained a rate of 54% for single women (1), which is not far from the 55.5% obtained by revising our original regression results (see Table 21).

Regions

On a regional basis, only annual data were available. The year 1953 ($t=1$) was chosen as the initial time period in order to preserve homogeneity with the quarterly data used for the age groups. The rate of increase of female employment used in the projection for 1980 is, for each of the regions, the average annual value for 1953 to 1967; these are listed in Table 21. For the male participation rate, it was assumed that it would have roughly the same value in 1980 as in 1967; account was taken of the 1980 canadian projection of 77.7% and of the 1980 projected working age population distribution by region. The 1980 time period is 28.0 since the time origin ($t=0$) is taken in 1952.

a) Atlantic and Quebec

Table 20 shows that only time had a significant "effect" on the female participation rate in Quebec and the Atlantic Provinces. The fact that the growth of employment had no influence on the rate is probably due to the existence of chronic and massive unemployment in these two regions, and this could imply that, at least for a large part of these regions, employment opportunities would not seem better to non-participating women even when employment is increasing rapidly. Table 21 shows that the projections for 1980 are 36.2% for the Atlantic region and 42.4% for Quebec.

(1) The cross-check was done as follows:

<u>Single women</u> <u>aged</u>	<u>1980 (projected)</u> <u>participation rate</u>	<u>Weight</u>	<u>Product</u>
14 - 19	34	0.60	20.4
20 - +	84	0.40	<u>33.6</u>
			54.0

b) Ontario and British Columbia

As can be seen from Table 20, both the rate of change of employment and time had a significant influence on these regional female participation rates for the period covered by the regressions (1953-1967). The projected rates for 1980 are 44.3% for Ontario and 46.0% for British Columbia, as shown in Table 21.

c) Prairies

As can be seen from Table 20, all four variables included in the regression model were found to have had a significant influence on the behaviour of the female participation rate for the Prairies. The significance and sign of the coefficient of the variables "change in employment" and "time" are as expected; this is not the case, however, for the two other variables. The two hypotheses we wanted to test, namely that the male participation rate had either no influence on the female participation rate, implying a non-significant coefficient, or that it had a negative influence (in line with the female-male substitution effect discussed earlier) on the female participation rate, implying a negative coefficient, are not verified since the sign of the latter turns out to be positive. Also, our hypothesis stating that the change in the male participation rate would reflect the prevailing economic climate (the over-reaction effect discussed previously), implying a positive sign for its coefficient, is not verified since a negative sign for the latter was obtained.

However, it is possible to submit a few untested hypotheses for the unexpected results. As far as the male participation rate is concerned, it could again be considered as a proxy for the tendency towards increased schooling for teenage girls. In the case of the rate of change of the male participation rate, the sign of the coefficient obtained in the regression is consistent with what is called the "additional worker effect". This refers to a theory which explains the increase that takes place in certain participation rates during periods of high unemployment and shortage of job opportunities by the fact that some women enter the labour force to seek employment in order to replace their family bread winner who has become

unemployed. It is interesting to note that our results indicate that the Prairies female participation rate could, to a certain extent, be submitted to this "additional worker effect". The 1980 projected female participation rate for the Prairies is 53.5%. This implies an extremely large increase compared to its 1967 value of 33.7%. But it must be pointed out that the Prairies female participation rate has been increasing very rapidly in the past, as can be surmised by examining the coefficients of the time variable in Table 20. The time variable coefficient for the Prairies is considerably higher than that for the other regions, indicating that the psychological, social and economic factors for which time is a proxy have produced an extremely large increase in this region female participation rate as compared to the other regions. Another fact which tends to make it possible to conceive that the Prairies will have a much higher female participation rate than the country as a whole in 1980 is the existence of what might be called "chronic overfull-employment" in that region. The Prairies overall unemployment rate has in the past generally been below the level of 3.0% considered to be a state of full employment. This could imply persistent labour shortages in that region, a situation very much different ^{from} to that of the Country as a whole. Under such circumstances, it seems plausible to think that the desire of women to work outside their home is much more easy to satisfy in the Prairies than anywhere else in Canada. However, the fact that the Prairies are not very industrialized and thus do not provide a large absolute number of non-farm jobs tends to somewhat mitigate the validity of this argument.

Total Female Population and Age Groups, Canada

Table 20 gives the numerical results that were used to make the projections for the 14+ population and the different age groups. It is seen that the rate of change of total female employment was not used in this case as an explanatory variable. The explanation for this procedure is the following. In a first attempt, all the variables of the "general regression model" were included: the rate of change of employment, time, the male participation rate, the rate of change of the male participation rate, the secondary

school enrolment rate (for the 14-19 age group), (1) the fertility rate for women aged 20 to 24 years (for that age group) and the rate of change of total consumer credit outstanding (for the total female population 14+). The results appear in Table 22. It was then discovered that there was a severe degree of collinearity (or correlation) between the male participation rate and the secondary school enrolment rate (a simple correlation coefficient of -0.978). Because of that, it was decided, for the 14-19 age group, to run another regression from which the male participation rate would be excluded. Also, since the rate of change of employment had either no effect on the female participation rate or one which became almost negligible for the purpose of long-term projection, it was decided, for the sake of homogeneity, to re-run all regressions but, this time, without the rate of change of female employment as a variable. Because it was conceivable that the observed pattern in the rate of change of female employment was due to variations in general economic conditions (a large segment of the growth of female employment being insensitive to the general state of the economy), we replaced the excluded variable by the rate of change of the Gross National Product. This was in effect an attempt to obtain more significant results from the point of view of including in the model the possible "effect" of employment conditions on the female participation rate. As can be seen in Table 22, the results were quite similar to those obtained by the initial run for the total, 20-24, 25-44 and 45-64 age groups while they differed considerably for the 14-19 and the 65 years and over age groups. In the discussion that follows, only the results used in the final projections, that is those appearing in Table 20 and Table 21, are considered.

Quarterly data starting with the second quarter of 1953 ($t=1$) were used. The 1980 time period is 109.0. The E.C.C. projection of 77.7% for the 1980 male participation rate was retained; also, its projection of 93.0% for the 1980 secondary school enrolment rate, as well as its estimate of 158.1 per thousand for the 1980 fertility rate for women aged 20 to 24 years were

(1) The 14-17 school enrolment rate was used as an explanatory variable for the 14-19 age group.

entered in the long-term forecasting model as 1980 values of those independent variables. For the rate of change of consumer credit outstanding, it was decided to use its average quarterly value of 2.8% calculated over the 1953 to 1967 period.

a) Total Female Population (14 Years and Over)

It can be seen from Table 20 that time, the male participation rate and the rate of change of consumer credit outstanding were all significantly correlated with the behaviour of the total female participation rate. Again, the sign of the coefficient of the male participation rate indicates that our original hypothesis (female-male substitution) is not verified empirically. It is probable that, as in the other two cases where the male participation rate had a significant influence (single women and women in the Prairies), the latter is a proxy for the school enrolment rate of teenage girls. However, it is interesting to note that, for the total female population of working age, the coefficient of this variable is much smaller than it is in the case of single women and the Prairies, an indication that it has had a much weaker influence on the total rate than on the two particular rates on which it also had some influence.

The rate of change of total consumer credit outstanding, which is the rate of change of total consumer indebtedness (excluding mortgages), was included to test the hypothesis that women are, to a certain extent, "pushed" into the labour force by their family indebtedness (either their own family or the one to which they belong). The contention here is that the pressure exerted on consumers to buy on credit has the effect of putting many families in such a financial position that it increases greatly the inducement to enter the labour force for a large proportion of all women. The absolute volume of consumer credit outstanding was not used in the model for two reasons. Firstly, because it is highly correlated with the time variable. Secondly, its rate of change was seen as possibly correlated strongly with increases in the participation rate.

The regression results shown in Table 20 indicate that the hypothesis tested is not verified, since the coefficient of the variable has a negative sign. A possible explanation for this unexpected result could be that the rate of change of consumer credit outstanding is, in the context of our model, a proxy for the general economic situation (as a matter of fact, consumer indebtedness tends to increase faster when the economy is booming, and employment growing rapidly). If this explanation is correct, this would mean that the rate of change of consumer indebtedness is a variable which takes into account the "additional worker effect" discussed earlier, since it is negatively correlated with the participation rate. More precisely, a low rate of growth of indebtedness would tend to imply that the total economy is in stagnation or in recession and that many women would then enter the labour force in an attempt to find employment so as to replace a member of their family who has lost his job; the contrary would hold when the rate of increase of indebtedness is high. This variable was not included in the other regressions because its possible influence, as far as projecting for 1980 is concerned, was deemed to be marginal. Table 21 shows that the original projection for the 1980 total female participation rate is 45.5%; the revised rate is 44.6%.

b) 14-19 Age Group

Table 20 shows that time and the secondary school enrolment rate had a significant influence on the participation rate for teenage girls. This is exactly what was to be expected in theory: time (that is, the factors for which time is a proxy) tends to make an ever-increasing proportion of all teenage girls who have dropped out of school enter the labour force instead of staying at home, but increased schooling has the effect of depressing the participation rate. The original 1980 projection for the 14-19 participation rate is 33.7%; the revised one is 34.1% (see Table 21).

Because the school enrolment rate, and thus the participation rate, are different for each age sub-group within the 14-19 age group, changes

in its relative composition (in terms of the sub-groups) might entail changes in the group participation rate, even if time had no influence and the school enrolment rate did not change. In other words, changes in the relative importance of the different age sub-groups may have an influence of their own on the group participation rate, an influence which is not explicitly taken into account in the regression used to project for 1980. Because of this, it was necessary to find out whether or not the result obtained by regression analysis was not invalidated by projected changes in the composition of the group. Table 29 gives all relevant data on this matter. The projected 1980 percentage distribution of the 14-19 population was constructed from the total number of female births from 1961 to 1966. If the 1967 sub-group participation rates are applied to this projected 1980 distribution, a rate of 33.3% is found. Since the rate obtained by regression is 33.7%, it can be concluded that the projection seems relatively accurate and this, for the following reason. Since the secondary school enrolment rate will not increase as fast as previously from now to 1980, it is almost certain that the sub-group participation rates will either remain constant or, which is more probable, increase slightly. Therefore, since the change alone in the composition of the group is projected to make for an increase from 31.6% to 33.3% in the group participation rate, a slight increase in the sub-groups participation rates would surely put it near 33.7% (perhaps at almost 34.1%).

c) 20-24 Age Group

It can be seen from Table 20 that time and the fertility rate for women of the 20-24 age group had a significant influence on the participation rate for women aged 20 to 24 years. This was to be expected since these two variables represent the two opposite forces working on this age group participation rate. The psychological, social and economic factors for which time is a proxy tend to induce non-participating women in this age group, whether or not they are married, to enter the labour force.

But a large proportion of all women in this age group is forced to retire from the labour force or is prevented from entering it by child-birth and the ensuing care of children, often for many years thereafter.

The fertility rate (births per 1,000 women) was included as an explanatory variable for this age group because the participation rate for women of this group, after remaining constant until around 1960, started to increase at precisely the same time (1960) the fertility rate for those women started to decline very sharply. This seems to indicate that the application of birth control methods substantially reduced the number of births and thus had a positive influence on the participation rate for women aged 20 to 24 years. The original projection for the 1980 rate is 64.3%; the revised one is 65.0% (see Table 21). The validity of these projections rests, in part, upon the assumption that birth control will continue making inroads, at least until 1980.

d) 25-44, 45-64 and 65 and Over Age Groups and Sub-Groups

Table 20 and Table 22-A show that only time had significance for the participation rates for women in these three age groups. As far as the 25-44 and the 45-64 age groups are concerned, this indicates that the overwhelming influence stems from those factors which induce an ever-increasing proportion of all women to work outside their home, especially married women whose children have been raised (45-64 age group, mainly). This last point is partly supported, at least, by the fact that the coefficient of the time variable is higher for the 45-64 age group than for the 25-44 age group.

Table 21 shows that the results of the projections for 1980 are the following: an original participation rate of 47.2% revised at 47.8% for the 25-44 age group; an original rate of 52.8% revised at 53.5% for the 45-64 age group and an original rate of 8.4% revised at 8.5% for the 65 and over age group. Table 22-A shows similar results for age sub-groups.

THE FEMALE LABOUR FORCE IN 1980: RESULTS

Table 30 to Table 34 give our final results in terms of the projected number of women in the 1980 labour force by age group, region and marital status.

It can be seen that the projections differ according to the Economic Council of Canada population projections to which the projected participation rates were applied. As stated earlier, many reasons suggest that the most realistic population projection is the one corresponding to the 70 thousands annual net immigration assumption.

We might add that our projections may perhaps appear to yield labour force figures that are rather high as compared to those of the E.C.C. However, the fact remains that female labour force projections undertaken in the past have generally tended to underestimate the strength of the factors responsible for the growth of the female participation rates. For instance, in its first annual review (1964), the Economic Council of Canada underestimated by about 5% the 1967 female labour force participation rate; in the specific case of the 20-24 age group, the underestimation ran as high as 9.8%. (1). Of course, part of this underestimation was due to temporary short-run conditions in the labour market linked with the great economic boom of the 1965-67 period. However, it has to be pointed out that an underestimation of nearly 5% over a short span of three years, even if part of it cannot strictly be called an underestimation (for the reason just given), can easily produce a very serious underestimation when longer term projections, such as the ones we have made, are undertaken.

Table 33 to Table 36 illustrate the changes that are projected to take place in the female labour force between 1967 and 1980 under the assumption of an annual net immigration of 70,000. Table 33 presents labour force levels for 1967 (actual) and 1980 (projected) as well as the projected percentage increases for each group. It can be seen that the labour force for women aged 65 years and over will, according to our projections, more than double while that for women aged 45 to 64 will nearly double; the total

(1) F.T. Denton, Y. Kasahara, S. Ostry, Projections de la Population et de la Main d'Oeuvre jusqu'à 1970, Etude No 1, Conseil Economique du Canada, Ottawa, décembre 1964.

female labour force of British Columbia will also nearly double. The fact that the labour force for "other women" has the lowest projected percentage increase within the marital status group is largely explained by the relatively low increase that is projected to take place in the participation rate for that group (80% widows). The last two columns of Table 34 show the actual percentage distribution of the labour force, within the groups, for 1967, and the projected distribution for 1980. Within the marital status group, the fact that married women will considerably increase their share of the total labour force comes as no surprise, given the 85% projected increase in their labour force.

As far as the regions are concerned, it is interesting to note that Ontario and the Atlantic Provinces will have a smaller share of the total Canadian female labour force in 1980. Within the age groups, the outstanding fact is the relatively large decline projected in the share of the total labour force occupied by teenage girls.

Table 35 is a working table from which Table 36 was derived. The latter gives the respective contributions of the population increase and the participation rate increase to the projected labour force increase for each group. If all participation rates remained constant from 1967 to 1980, the single fact that the different populations will grow would make for an increase in the labour force for the different groups; this is the contribution of the population increase to the increase in the labour force, and it is derived by applying the 1967 participation rate to the projected population increase. But, because participation rates will also increase, the 1980 labour force will obviously increase by more than is called for by the population increase alone. Even if there was no increase in the population, the single fact that the different participation rates will increase would make for an increase in the labour force for the different groups; also, if in addition the fact that an increased participation rate will be applied to an increased population is taken into account, a still larger increase in the labour force results. This is the contribution

of the increase in the participation rate to the increase in the labour force (1).

As can be seen from Table 36, the respective contributions of the population increase and the participation rate increase differ widely from one group to another. The last column of Table 36 shows that while the contribution of the participation rate increase is almost negligible in the case of "other women", it explains more than three-quarters of the projected increase in the labour force of the Prairie Provinces. It is interesting to note that the increase in the participation rate will contribute more than half of the projected increase in the total female labour force (57.3%).

(1) The mathematical derivation is as follows:

Let L = labour force;
 R = participation rate;
 P = population;
 Δ = increase.

We can write $L = R P$
 $\Delta L = R (\Delta P) + P (\Delta R) + (\Delta P) (\Delta R)$
 $\Delta L = R (\Delta P) + (P + \Delta P) (\Delta R)$
 $\frac{\Delta L}{L} = \frac{(\Delta P)}{P} + \frac{(P + \Delta P) (\Delta R)}{RP}$

where $\frac{\Delta L}{L}$ = relative increase in labour force;
 $\frac{\Delta P}{P}$ = contribution to the relative increase in labour force of the relative increase in population given the same participation rate (R);

$\frac{(P + \Delta P) (\Delta R)}{RP}$ = contribution to the relative increase in labour force of the relative increase in the participation rate given the new increased population (P + ΔP);

ΔL = absolute increase in labour force;

$R (\Delta P)$ = contribution to the absolute increase in labour force of the absolute increase in population given the same participation rate (R);

$(P + \Delta P) (\Delta R)$ = contribution to the absolute increase in labour force of the absolute increase in the participation rate given the new increased population (P + ΔP).

Comparison with Economic Council of Canada Estimation

Table 37 shows a comparison between the authors projections and the estimation of the E.C.C. for the 1980 participation rate and labour force by age group. The outstanding fact, here, is that we project a total female participation rate of 44.6% for 1980 while the E.C.C. projected in late 1966 a rate of 40.1%. Our projection is thus more than 10% higher than that of the E.C.C. But, as explained earlier, nothing seems to suggest that this constitutes an overestimation, especially so since past estimates given by the E.C.C. in its First Annual Report (1964) turned out to be under actual rates by a somewhat large margin.

The 45-64 group presents the widest gap between the two projections: 45.7% by the E.C.C. as against 53.5% by the authors. In view of the recent behaviour of this age group participation rate and considering the fact that it is difficult to imagine which factors could make for a slow-down in its extremely rapid growth in the near future, it is probable that the E.C.C. has underestimated the 1980 value of the participation rate for the 45-64 age group. As far as the labour force is concerned, the differences between the E.C.C. estimates and the authors projected values reflect those of the participation rates projections.

It can be seen from the first three columns of Table 37 that the total participation rate for males estimated by the E.C.C. is nearly twice as high as its projections for the total female participation rate; the difference between the total male rate and the authors projected total female rate is smaller but still considerable. Since the difference between male and female rates for the 14-19 age group is relatively small, the large difference between the sexes in the total rate comes from the still larger relative difference (more than 100%) between males and females in the participation rates for the 25-44 and 65 and over age groups and also from the wide difference in the rates for the 20-24 and 45-64 age groups.

It should be noted that the different male participation rates tend to be at their maximum value, even at 36.7% (14-19) or 21.7% (65 and over), because practically all men who are neither at school nor invalid or retired, are in the labour force. The same cannot, obviously, be said for women.

For the labour forces, the male and female working age populations being approximately the same in each age group, it follows that, given the differences between the participation rates, the different projected male labour forces are considerably larger than the corresponding female labour forces; the 1980 male labour force estimated by the E.C.C. (7017 thousands) is 71.5% higher than our 1980 projected female labour force level (4095 thousands) and 90.5% higher than its own estimate for the level of the 1980 Canadian female labour force (3681 thousands).

Intermediate Projections for 1970 and 1975

Table 38 gives actual 1967 and projected 1970, 1975 and 1980 values for female participation rates, working age populations and labour forces (in numbers and percentage distributions).

Within the marital status groups, we note that the participation rate for separated, divorced and widowed women is projected to be lower than in 1967 (28.9%) for both 1970 (27.9%) and 1975 (28.5%), but that it should end up slightly higher in 1980 at 29.2% relatively to 1967. The fact that the participation rate for this group has increased relatively slowly with time, between 1959 and 1967, coupled with the fact that the 1967 actual value falls above the estimated regression line (positive disturbance), explains this apparently peculiar result.

As discussed earlier, married women should constitute a much larger proportion of the total female labour force comparatively to 1967, their share increasing from 53.3% to 57.1%.

For the regions, the most noteworthy fact is the steady decline projected in the relative importance of the Atlantic and Ontario female

labour forces, between 1967 and 1980, in the Canadian total female labour force. It should also be noted that the Quebec female labour force should maintain approximately the same share of the total until 1980, with only a slight increase from 27.9 (in 1967) to 28.2% (in 1980).

As far as the age groups are concerned, the interesting aspects of Table 38 are the labour force distributions. It can be seen that, relatively to the total, the 14-19 age group is projected to steadily decline in importance (from 15.1 to 11.0%) while the 65 and over age group should increase from 1.9 to 2.3% between 1967 and 1980. The 45-64 age group should see its share of the total increase until 1975, from 27.0 to 30.2%, but its relative importance is not projected to be different in 1980 relatively to 1975. The relative importance of the 25-44 age group should be reduced relatively to 1967 in both 1970 and 1975: from 37.7% in 1967 to 35.7% in 1970 and 36.3% in 1975; however, it should be higher in 1980, at 38.9%, than it was in 1967. A similar pattern is projected for the 20-24 age group, but in the opposite way; its relative importance should slightly decrease from 1967 (18.3%) to 1980 (17.6%), but it should attain a higher value than in 1967 between these two years: 19.2% in 1970 and 18.7% in 1975. Results are also given for age sub-groups.

Projection Errors

It should be emphasized that the differences between the 1980 actual values (to be known in 1980 only) and the projected values come from two sources. Firstly, the estimated regression lines have, in each case, a given variance about the "true" line; secondly, the 1980 disturbances (observed values minus calculated values) about the "true" lines also each have a variance. The combination of those two variances yields an "individual projection error". In 1980, the two sources of error might tend to cancel one another if they happen to move in opposite directions; conversely, they might move in the same direction and add up.

What we are concerned with is not the 1980 (residual) errors about the "true" lines but the 1980 errors coming from the fact that our

estimated regression lines have a variance about the "true" regression lines. In other words, we are interested in knowing what kind of errors we can make for the 1980 mean values of the female participation rates and labour force levels, 1980 being a more or less arbitrary year (as compared to 1978 or 1982, say).

A measure of the relative error of estimation (or projection) can be obtained by calculating the coefficient of variation. This coefficient is defined as the ratio of the standard error of an estimate over the value of the estimate (in percent). Table 39 shows the coefficients of variation for all parameters and projections obtained in this section. For example, the expected relative standard error for the 1980 mean value of the total female labour force is (plus or minus) 4.2%. This 4.2% error is the sum of a 2.5% error on our projected total female participation rate and of a 1.7% estimated error on the Economic Council of Canada projected 14-+ female population (because net immigration has a variance). Similar labour force errors were found for "married women" (4.3%) and females living in "Ontario" (3.9%). Details about the technical aspects behind the results shown in Table 39 are given in appendix to this report.

The 2.5% relative error on the projected 1980 total female labour force participation rate (44.6%) is obtained under the assumption that its past linear trend will continue until 1980. It should be strongly emphasized, however, that this past trend is expected to break off around 1980, since the Canadian total female participation rate will likely have reached the projected 1980 participation rate for females in the United States, which might be tentatively considered as an upper limit for Canadian females.

In relation to the expected relative increases in specific labour force groups, Table 74 gives the error margins attached to them. For example, there is a 16% risk that the actual 1967-80 relative increase in the total (14-+) female labour force participation rate might exceed 80.4% due to prediction errors inherent to our forecasting model. The 1967-80 expected increase is 73.1%.

SECTION III

FEMALE EMPLOYMENT IN 1980

POST-WAR TRENDS IN FEMALE EMPLOYMENT

Employment and Demand

Strictly speaking, female employment and the demand for female workers are not the same thing. In times of labour shortage, for example, the demand of employers in terms of the number of workers needed might exceed by a more or less considerable margin the actual number of people already employed. In such a case, employment would obviously not represent the demand for workers very accurately. But when there is no labour shortage (except, perhaps, in a few specific trades or professions, or in a few industries during an economic boom), employment can be considered as representing the effective demand of employers for workers. Except for the immediate years after World-War II when there was over-full employment, Canada has not had to reckon with a general labour shortage, so that studying the behaviour of female employment in the Post-War period is equivalent to studying the behaviour of the demand for female workers during that twenty-year period. We shall thus use data on employment to make projections, for 1980, of the demand for female labour. Before tackling the main part of the present section, the projections themselves, we shall briefly discuss the major trends in the behaviour of female employment (or the demand for female labour) in the Post-War economy.

Tables 40, 41 and 42 give, respectively, the average annual number of women employed for each sector of the national economy, for the main occupation groups and for the five principal economic regions of Canada, from 1946 to 1967.⁽¹⁾ Tables 43, 44 and 45 show the percentage changes that have taken place in female employment by sector, occupation and region, respectively, from 1948 to 1967, from 1948 to 1957, the first decade of the Post-War period, and from 1958 to 1967, the second decade.

(1) Table 41 actually begins with 1948 data.

It can be seen that, while total female employment more than doubled for the entire period covered (an increase of 119.4%), it has increased nearly twice as much during the second decade (59.5%) as it had during the first ten years of the 1948-67 period (33.7%).

Sectors

If the main sectors of the economy are considered, Table 43 shows that, from 1948 to 1967, non-agricultural employment increased by 140.4% but that agricultural employment dropped by 41%. Female employment in the service-producing industries increased by 165.3% during the twenty-year period, while it increased by only 62.8% in manufacturing, the sector employing most of the women working in non-agricultural goods-producing industries. It can also be seen that the fastest growth of employment took place in community, recreational, personal and business services (233.7%). Employment has grown relatively slowly in Trade (100.5%), Transportation and communications (89.7%) and in Public administration (92.7%) during this same twenty-year period. It is interesting to note that female employment increased at very different rates from one decade to the other in those last three sectors. But it is in Agriculture that female employment exhibits the most startling behaviour; after a decline of 68.1% from 1948 to 1957, it increased by 38.4% during the following ten years.

Occupations

For the occupation groups, Table 44 shows that the increase in the number of saleswomen (66.9%) and female production workers (54.8%) was relatively mild from 1948 to 1967 and that the number of farm workers dropped by 43.8%; the sharpest increase occurred in the number of professionals and technicians (283.5%) while the increase was also high for managers (160.6%), office workers (151.4%) and service workers (169.5%). It can also be seen that the number of saleswomen and production workers has increased twice as much during the 1958-67 decade (40.1 and 39.7%, respectively) than it had from 1948 to 1957 (19.1 and 18.7%, respectively).

The change that took place in the number of farm workers (-43.8%) parallels the one that took place in female agricultural employment (-41.0%). As can be seen by comparing the second with the third numerical column of Table 44, the percentage increases in the number of women employed in the different occupation groups show much less difference between themselves for the 1958-67 decade than they did for the 1948-57 decade. This means that employment gains were spread much more evenly between the different occupations during the last ten years than was the case for the 1948-57 period, and it is mainly attributable to the fact that the increase in the number of saleswomen, production workers and farm workers was considerably larger in the second decade.

Regions

The changes in female employment by region are shown in Table 45. If the 1948-67 period is considered, it can be seen that the increases in female employment for the Atlantic (121.0%), Quebec (124.7%) and Ontario (117.5%) regions were close to that for the country as a whole (119.4%), but that the increase was much smaller for the Prairies (97.3%) and much larger for British Columbia (151.1%). A comparison between the two decades shows that female employment in Quebec and British Columbia increased twice as much during the 1958-67 decade (60.2 and 79.3%, respectively) than it did during the 1948-57 period (30.7 and 38.9%, respectively), and that female employment in the Prairies increased four and a half times as much in the last decade of the 1948-67 period (56.0%) as compared to its increase in the first decade (12.6%).

Distributions

Tables 46, 47 and 48 give, respectively, the percentage distributions of total female employment by sector of the economy, by occupation group and by region, from 1953 to 1967. These distributions were not calculated for farther back than 1953 because the long-term trend generally changes in 1953. Let us add at this stage that it is these 1980 predicted

distributions which will be used to make the demand projections by sector, occupation group and region.

Distribution by Sector

Two main points can be observed from Table 46. Firstly, Agriculture having retained a constant share (about 3%) of total female employment over the entire period covered, service-producing industries increased their share of total employment at the expense of non-agricultural goods-producing industries (manufacturing), from 1953 to 1967: service-producing industries increased their share of the total by seven percentage points (from 70.9 to 77.7%), while Manufacturing (where most of the women working in non-agricultural goods-producing industries are employed) saw its share reduced by seven percentage points (from 24.1 to 17.2%). Secondly, it can be seen that, in addition to Agriculture, Public administration and Finance also kept a constant share of total employment (about 4.6 and 6.4%, respectively) and that, while Community, recreational, personal and business services considerably increased their share of the total (from 34.4 to 45.6%), Trade and Transportation and communications, like Manufacturing, saw their share decline, during that fifteen-year period (from 20.9 to 17.7% and from 4.6 to 3.2%, respectively).

Distribution by Occupation

From the point of view of the occupation groups, the situation is quite clear-cut since it has changed very little from 1953 to 1967. As can be seen from Table 47, managers, office workers, service workers and farm workers (who constitute all together about 60% of total employment) all retained a more or less constant share of total female employment over the entire period covered. Professionals and technicians increased their share of the total (from 11.8 to 17.2%), while saleswomen and production workers are seen to constitute an ever-declining share of total employment.

Distribution by Region

As far as the regions are concerned, Table 48 shows that Eastern Canada (Atlantic, Quebec and Ontario) registered a decline in its share of

total female employment over the 1953-67 period while Western Canada increased its share over the same period. Of even greater interest is the fact that the percentage distribution of female employment by region is relatively constant as compared to the distribution by sector or occupation.

Female Share of Total Employment

Table 49 shows that the share of female employment in total employment has increased from 22.6% in 1946 to 31.1% in 1967, with most of the increase having taken place since 1955. As can be seen from Figure 48, the relatively stable evolution of the share of female employment in the total since 1955 permits to visually extrapolate to 1980 and to suggest that women could constitute around 39% of all employed persons in that year. This, of course, is conditional upon the assumption that female employment will go on increasing as fast, relatively to total employment, as it has for the past twelve years, which is not certain.

Graphical Illustrations

A graphical presentation of the evolution, since 1953, of the distribution of total female employment by sector of the economy, by occupation group and by region is given by Figures 27 to 47. It should be noted that the evolution of the absolute number of women in each occupation, sector or region is not presented graphically because the method used to make the projections is based on the evolution of the distribution of female employment rather than on that of its absolute level. Thus, the latter is less important for our immediate purpose.

Female Production Workers in Manufacturing Industries

Tables 50 to 56 present more detailed information on female production workers, nearly all of whom are in the manufacturing sector of the economy. In 1967, female production workers constituted 11.2% of total female employment. Tables 50, 52 and 54 give, respectively, for Canada, Quebec and Ontario the distribution of female production workers in the different manufacturing industries, while Tables 51, 53 and 55 show

those manufacturing industries where women account for half or more of all production workers, in these same regions. Table 56 presents the results of simple correlation calculations that were made with data on the average size of manufacturing establishments, the value of productivity and average hourly earnings. These calculations covered 136 industries for Quebec and Canada less Quebec, 154 industries for Ontario and 171 industries for Canada. The results of Table 56 can be summarized as follows:

- a) The smaller the size of an industry's establishments is, the larger the proportion of women in that industry tends to be.
- b) The lower the level of productivity is in an industry, the larger the proportion of women in that industry tends to be.
- c) The lower the level of earnings in an industry is, the larger the proportion of women in that industry tends to be.
- d) The larger the share of the value of shipments going to wages is, the larger the proportion of women in that industry tends to be.

These results are in line with economic theory: because women usually constitute "cheap labour", industries where (for technological and other reasons) the level of productivity is relatively low tend to use them as much as possible on their production lines. This is because low productivity industries (such as the different clothing industries) cannot generally "afford", from a survival point of view, to pay average or higher than average wage rates. Since there is relatively little capital equipment per worker in these industries, a very large share of total cost is made up of wage costs, labour being the main factor of production. Also, because only a small amount of capital is required in order to produce, these industries tend to consist of a very large number of medium and small size establishments.

Earnings and Education

Table 57 shows, for the census year 1961, the average annual earnings of female wage-earners by occupation group. It should be emphasized here that these data, in addition to reflecting differences in wage rates between the occupation groups, also reflect differences between these groups

in the proportion of women who work only on a part-time basis. For example, it is probable that most female farm workers work only part of the year, and this is reflected in their low average earnings. Table 57 reveals that women who worked as managers, office workers or professionals and technicians earned above average incomes. This is in line with common knowledge that women who get the highest wages are those who are managers, professionals, technicians, secretaries, typists, etc..., while those who receive only average or below average wage rates are those who work on the floors of stores and factories and those who work as service workers.

Table 58 gives, for 1961, two measures of the level of education attained by women who constitute the different occupation groups. It is, of course, not surprising to find the highest proportion of high school and university graduates among managers, office workers, professionals and technicians and the lowest proportion among production and service workers. Perhaps the most interesting point about these data is that they can be considered to represent the educational requirements of the occupation groups. Given the total number of women in each group for 1980, it will be possible to determine the educational requirements of the aggregate number of jobs for women in 1980, that is, the proportion of all employed women who should be high school or university graduates in order that most jobs offered to women be filled by them. (1)

(1) See pp. 66-68, below.

EMPLOYMENT PROJECTIONS FOR 1980

Distribution of Total Female Employment

The first step towards projecting the 1980 demand for female labour consisted in establishing projections of the percentage distributions of total female employment by occupation group, by sector of the economy and by region, for 1980. This was done by running straight line regressions between time (as the independent variable) and the different distribution percentages which have shown a definite upward or downward trend over the past 15 years or so. The results of these regressions are given in Table 59; more detailed results are given in Table 60.

This method of projecting the 1980 percentage distribution is based on the assumption that certain distribution percentages increase or decrease linearly with the passage of time. An examination of the graphical presentation⁽¹⁾ supports this assumption of linear evolution with time. As for those distribution percentages which, over the whole of the period covered, clearly remained more or less constant, their 1980 projected value was estimated by taking the average value for the 1953-67 period. Since there are no foreseeable reasons for thinking that these percentages will start moving either upward or downward from now until 1980, this simple method appears to be adequate. (2)

We can now examine closely the results of Table 60. For the occupation groups, it can be seen that, between 1967 and 1980, the relative importance of saleswomen and production workers will decline while that of professionals and technicians, and service workers, will increase. The relative importance of the other groups is projected to remain approximately constant. The most interesting feature, here, is evidently the very sharp drop projected in the relative importance of production workers. This, very likely, is related to the more rapid growth of productivity in manufacturing relatively to its growth in other sectors of the economy (except agriculture).

(1) See Figures 27 to 47.

(2) Three sub-groups (other occupations, other sectors and the Prairies) were obtained as residuals.

These projected changes in the relative importance of the occupation groups are largely explained by those which are projected to take place in the distribution of total female employment by sector of the economy. As can be seen, the relative importance of manufacturing and of wholesale and retail trade will decline, while that of services, where a large portion of all female professionals and technicians are employed, is projected to increase. No changes are foreseen in the relative importance of public administration, finance and agriculture, while transportation and communications will be employing a sharply reduced share of all working women. Of course, all these predictions are subject to error. (1)

Total Female Employment: Labour Force minus Unemployment Approach

Table 61 presents the most simple and intuitive method for projecting total female employment for 1980. The approach consists in using assumed unemployment rates and the 1980 labour force projections for males and females.

Section I of this study established an expected female labour force for 1980, under an assumption of an annual net immigration of 70,000, at 4,095 thousands. On the other hand, we subscribe to the findings of the Economic Council of Canada (2) to the effect that the participation rate for males in 1980 will be about the same as in 1967 (77.7%) and that the 1980 male labour force will be of the order of 7,017 thousands. This would, therefore, add up to a total labour force of 11,112 thousands, in 1980.

Assumed figures for both the male and female unemployment rates have been applied, respectively, to the projected male and female labour force projections, for 1980 in order to determine the total employment projections by sex that year. From 1953 to 1967, the annual average unemployment rate for males was 5.7%; a male unemployment rate of 6% is therefore a figure in line with the experience of the last fifteen years.

(1) The very important matter of prediction errors will be discussed below (see Table 70).

(2) Cf. Staff Study No. 19 on cit

For women workers, a rate of 3% seems to be a good description of the "usual" amount of unemployment; the average annual rate for the period 1953-67 was 2.8%. However, since it is possible that, even if it increases very rapidly, female employment will not grow fast enough relatively to the increase in the working age population, an unemployment rate of 5% was also used as a somewhat "extreme" alternative assumption. Table 61 shows the male, female and total employment levels corresponding to each of these two unemployment rate assumptions. It can also be seen that the 1980 female share in total employment would consequently hover around 37%.

Total Female Employment : Autonomous Methods

The projection method just described must be supplemented, that is, employment must be projected by other means, independently of the labour force projections. This must be done because, if the labour force projections, as such, happened to be biased, the simple method would produce employment projections that could not be accurate. In other words, other methods must be used as a cross-check on the validity of the labour force projections and that of the employment projections derived from them. In addition, the method described earlier is useful in that it indicates a certain range close to which the employment projections made by autonomous means should fall in order that our projected figures for the supply and the demand for female workers be mutually consistent. For total employment, the range is of the order of 10,486 to 10,568 thousands, while for female employment, it is of 3,890 to 3,972 thousands, as can be seen from Table 61.

One of these autonomous methods consists in making the assumption that production, (total output), total employment and female employment will go on increasing, from now to 1980, at the same rate as in the last fifteen years or so. This implies running semi-logarithmic regressions between these variables and time (which is the independent variable). Roughly speaking, it is equivalent to making the assumption that if, for example, the economy's total production of goods and services increased by about 80% from 1953 to 1966, it would also increase by about 80% from 1967 to 1980.

Table 62 gives the data on production and productivity (production per worker) which were used in the regressions giving the projections. The results of those regressions are shown in Table 63. Table 64 presents the final projection results for total, female and male employment in 1980 using a combination of autonomous methods (see also Figures 50 and 51).

In Table 64, total employment for 1980 was derived from projections for total production of goods, total production of services and productivity in the private sector of the economy (the "commercial sector" as opposed to the public sector which comprises community services and public administration). (1)

Total production of goods and total production of services in 1980 were projected by fitting semi-logarithmic regressions between these two variables and time. Since a straight line regression implies a decreasing rate of change of the dependent variable as the independent variable increases, it could obviously not be used to project the 1980 production of goods and that of services because they tend to grow at quite constant rates, on a long-term basis.

(1) Mathematically, the method can be described as follows. Let

Q = physical production
P = productivity (physical production per worker)
E = number of workers
 Δ = increase (in decimals)

We can write

$$E = Q/P$$

and it follows that

$$(\Delta E/E) = \frac{(\Delta Q/Q) - (\Delta P/P)}{1 + (\Delta P/P)}$$

where

$\Delta E/E$ = relative increase in employment
 $\Delta Q/Q$ = " " " production
 $\Delta P/P$ = " " " productivity.

On the other hand, a semi-logarithmic regression implies a constant rate of change of the dependent variable (1). Our results indicate that, from 1966 to 1980, total production of goods should increase by 89.1% and that its annual rate of growth should be 5.0% while total production of services should increase by 76.3% with an annual rate of growth of 4.2%. The expected production of goods and services (Gross Domestic Product) for 1980 is obtained by adding the projections for total production of goods and total production of services: from 1966 to 1980, it should increase by 83.5% and its annual rate of growth should be 4.6%.

The projection of the level of productivity (output per employed worker) in the private sector of the economy for 1980 was made by fitting a straight line regression between the latter and time. Because productivity tends to grow at a decreasing rate, the projection could not be made by semi-logarithmic regression (see Figure 51).

(1) The exponential model used was

$$Y_t = a b^t$$

or $\log Y_t = \log a + (\log b) t$

where Y_t = dependent variable at time t

t = time (annual data)

a, b = parameters (regression coefficients)

\log = logarithm (base 10)

$\log a$ = constant term (intercept)

$\log b$ = slope

The annual rate of growth (r) of Y_t is a constant and is derived as follows:

$$\begin{aligned} r &= (Y_{t+1} - Y_t) / Y_t \\ &= (ab^{t+1} - ab^t) / ab^t \\ &= b - 1 \end{aligned}$$

$$r = \text{antilog}(\log b) - 1.$$

For example, the annual rate of growth for the production of goods in Canada is (see Table 63):

$$r = \text{antilog}(0.02109) - 1 = 0.050 \text{ or } 5.0\%.$$

This secular decline in the rate of growth of productivity is due, mainly, to the fact that employment in low-productivity industries is seeing its share of the economy's total employment increase at the expense of employment in high-productivity industries. For example, the relative importance of agricultural and mining employment is decreasing while that of service employment is increasing. Another factor is the decline in the average work-week, that is, the average number of hours of work per week. According to our projection results in Table 63, productivity in the private sector of the economy should increase by 32.5% from 1966 to 1980. The decline in its annual rate of growth is shown by the fact that it was 2.6% in 1966 and that it is projected to be 1.9% in 1980.(1)

(1) The linear model used was

$$Y_t = g + h t$$

where Y_t = dependent variable at time t

t = time (annual data)

g = constant term (intercept)

h = slope

We can write

$$\Delta Y = h (\Delta t)$$

$$\frac{\Delta Y}{Y} \bigg|_{\Delta t=1} = \frac{h}{g + h t}$$

where ΔY = absolute increase in Y

Δt = absolute increase in t ; $\Delta t=1$ for an annual increase

$$\frac{\Delta Y}{Y} \bigg|_{\Delta t=1} = \text{relative increase in } Y \text{ given } \Delta t=1; \text{ in decimals.}$$

It follows that the annual rate of increase in Y (in decimals) is decreasing with time; in percent it is expressed as

$$100 h / (g + h t).$$

For example, the rate of growth in productivity is projected to be (see Table 63):

$$100 (4.46)/235.0 = 1.9\% \text{ in 1980 relatively to 1979;}$$

between 1966 and 1967 it was expected to be 2.5%, a higher value than the 1979-80 rate just calculated (1.9%).

Although the annual rate of growth of productivity will be decreasing, an average annual rate of growth for the period 1966-80 can be calculated, (1) as if it was constant; in the present case, it is 2.0%. For the public sector of the economy, it is assumed that productivity will not change at all. This is the procedure used by the Dominion Bureau of Statistics for the estimation of National Accounts data.

Given projections of total production and productivity for 1980, the consequent increase in employment can be calculated by using the formula described in the footnote to page 57. It can be seen, in Table 64, that it was assumed that production in both the private and public sectors of the economy would increase at the same rate, from 1966 to 1980. This constitutes a reasonable assumption since these two sectors tend to maintain a constant share of total production. Total employment is seen to be projected to be 10,485 thousands in 1980.⁽²⁾ This implies an increase of 46.6% from 1966 to 1980 and an annual rate of growth of 2.9%.

Female employment for 1980 was obtained by applying the 1980 projected share of female employment in total employment to the projection of total employment for that year (see Figures 48 and 50).

(1) If we had postulated an exponential model, we would have obtained a constant rate of growth (r) different from the above, except when

$$\begin{aligned} r &= h / (g + h t) \\ \text{or } t &= (1/r) - (g/h). \quad (\text{See (1), p. 59}). \end{aligned}$$

In the case of productivity, the value of r , between 1966 and 1980, was estimated to be 0.02 (or 2%). This means that equality between the two rates would occur when

$$t = (1/.02) - (114.6/4.46),$$

that is, approximately at time $t = 24$; since $t = 0$ in 1952, it follows that both results would be equal in 1976.

(2) A value almost identical to the one (10,486) obtained in Table 61 by assuming 6% and 5% unemployment rates for males and females, respectively.

The share of female employment in the total was projected from a straight line regression of the latter on the total male and female participation rates (see Table 63). This implies the assumption that the demand for female labour will go on increasing until 1980 at the same rate, relatively to the demand for male labour, as in the past fifteen years or so, and that the change that will take place in the participation rate of each sex will determine the behaviour of the share of female employment in the total for 1980, since the working age population will increase at more or less the same rate for each sex. According to the projection results of Table 63, the share of female employment in total employment will be 38.2% in 1980. It should be recalled here that a graphical extrapolation (Figure 48) of this variable gave 39% while the "labour force minus unemployment" method of deriving female employment (Table 61) yielded 37.6% under unemployment rate assumptions of 6% for males and 3% for females.

Applying the projected share of 38.2% to total employment for 1980, a projection of 4,005 thousands was obtained for average female employment in that year. This means that female employment should increase by 84.6% from 1966 to 1980 and that its annual rate of growth should be 4.5%. As a cross-check against these results, total employment as such was projected after fitting a semi-logarithmic regression between it and time. As shown in Table 63, a total employment of 10,450 thousands was obtained, as compared to that of 10,485 thousands obtained by the "output increase-productivity increase" method. The difference between these two projections is only 0.3%, which is negligible.

As can be seen from Part C of Table 64, the method used yields an overall unemployment rate of 5.6% for 1980. This is in line with the 5% average of the 1953-1967 period. However, the 7.6% projected male unemployment rate is much higher than the 5.7% average of the past fifteen years, while the 2.2% female unemployment rate is somewhat lower than the 2.9% average of those (1) last fifteen years. The higher than expected rate for males is attributable chiefly to the fact that, from now to 1980, the male labour force will increase

(1) The matter of projection errors is important here, as will be seen later.

faster than it has in the past because the male participation rate will not decline any further. On the other hand, production, and consequently the demand for male workers, will increase at approximately the same rate as in the last fifteen years. It then follows necessarily that the male unemployment rate will tend to be pushed upwards unless, of course, the sectors or jobs where most of the men are employed should grow at a faster rate than in the past.

As for the female unemployment rate, it is plausible to conceive that it will tend to decrease in the future. First of all, contrary to what is projected to happen in the case of the male labour force, the relative increase in the female labour force between 1966 and 1980 is projected to be slightly lower than it has been between 1952 and 1966; (1) this factor will obviously make for a decline in the female unemployment rate. A second factor has to do with the projected change in the percentage distribution of total female employment by occupation group. Our projection results for 1980 indicate that there will be a sharp decline in the relative importance of female production workers and saleswomen, occupation groups which are exposed to unemployment by their very nature, while the relative importance of female professionals and technicians, an occupation group which is probably never seriously touched by unemployment, will increase strongly. In other words, the 1980 female labour force will include proportionately less women who are exposed to unemployment. This second factor is evidently of a different nature than the first one. While the first factor constitutes an explanation derived from the projection of the female labour force, the second factor is simply an indication that the distribution projections did yield results in agreement with the female unemployment rate that they imply. (2)

(1) From 1952 to 1966, the male labour force increased by 25.3% and the female labour force did so by 88.7%. From 1966 to 1980, it is expected that the male labour force will increase by 35.1% (instead of 25.3%) and that the female labour force will do so by 83.9% (instead of 88.7%).

(2) Again, these tentative explanations must be related to the size of our projection errors which are not negligible (see Tables 70, 71, 72 and 74).

As can be seen by comparing Tables 61 and 64, the results obtained from both methods are quite consistent with the female labour force projections made earlier, if we take into account projection errors for the regions.

Employment by Occupation Group, Sector and Region

Table 65 gives female employment in each occupation group, sector and region for 1980 as well as its percentage increase, between 1967 and 1980. This was obtained by simply applying to the 1980 projected female employment of 4,005 thousands the projected percentage distributions of female employment for 1980 shown in Table 60; intermediate projections for 1970 and 1975 are given in Tables 66 and 67.

a) Occupation Groups

It can be seen from Table 65 that there should be little change (2.7%) in the number of female production workers between 1967 and 1980 while the number of female professionals and technicians should more than double (128.1%). A large increase is also projected in the number of farm (94.1%), office (71.9%) and service (84.4%) workers. The number of saleswomen should increase rather moderately (39.6%) as compared to the other groups. (see Table 74 for projection errors).

b) Sectors of the Economy

For the sectors, the outstanding fact of Table 65 is the sharp increase projected in the number of women employed in community, recreational, business and personal services (116.3%). The projected increase in female employment in Trade (43.7%), agriculture (83.3%) and manufacturing (5.8%) is seen to largely explain, respectively, the projected change in the number of saleswomen (39.6%), farm workers (94.1%) and production workers (2.7%). The relatively large decline in the number of women employed in transportation and communications (-18.9%) probably reflects the strong productivity gains taking place in this sector.

c) Regions

It can be seen from Table 65 (revised results) that female employment should double in British Columbia (101.3%) while it should increase by less than two-thirds in Ontario (64.4%) and by about one-half (50.8%) in the Atlantic Region.

Also, female employment should increase more in the Prairies (89.5%) than it will in Quebec (76.6%) and in the whole of Canada (74.4%).

Perhaps one of the most striking features of our projections is the fact that agriculture will constitute a "growth sector" for female employment; the number of female farm workers is projected to increase by 94.1% between 1967 and 1980, as compared to 74.4% for total female employment. This is the result of the process whereby female workers are being substituted for male workers in Canadian Agriculture; from 1953 to 1966, the number of female farm workers saw its share of total farm workers increase from 4.9% to 11.6%. It should be emphasized that this sharp 1967-80 increase of 94.1% in the number of female farm workers does not imply a rapid growth of agricultural production; on the contrary. For instance, agricultural production increased by only 22.9% between 1953 and 1966 (as compared to 77.8% for the economy's total output of goods and services) while agricultural productivity increased by 96% during the same period. The slow growth of output combined with this very high increase in productivity resulted in a drop of 36% in the total number of farm workers from 1953 to 1966, but the number of female farm workers actually increased by 52.4% (that of male farm workers declined by 40.7%). It is thus clear that it is mainly a male-female substitution process which should make the number of female farm workers increase rapidly from now until 1980.

Another striking result is that, in 1980, manufacturing might not constitute a much larger source of jobs for women than in 1967. This is reflected in the 2.7% projected increase in the number of female production workers between 1967 and 1980. The main explanation for this situation is to be found in the slow growth of many of the industries employing a relatively large share of all female production workers as well as in the rapid growth of productivity in the manufacturing sector generally. As can be seen from Table 50, a large part of all

female production workers is employed in industries such as those making leather products and clothing, industries which are relatively slow growing ones. For example, while the economy's total output increased by 77.8% between 1953 and 1966, production of leather products increased by only 30.1% during the same period and output of clothing went up by 57.3%. Moreover, productivity usually grows quite rapidly in manufacturing; from 1953 to 1966, its average annual rate of growth was 3.7%. This tends to restrain employment to a greater extent than in service industries where productivity increases only half as fast.

As far as the regions are concerned, the outstanding feature is the much faster growth of female employment (relatively to the whole country) projected for Western Canada. For British Columbia, the expected increase of 101.3% in female employment between 1967 and 1980 is explained by the faster growth of its economy. This is shown by the fact that total employment in this region increased by 57% from 1953 to 1966 while it grew by only 36.8% for the country as a whole. For the Prairies, the projected 1967-80 increase of 89.5% in female employment is probably explained for the most part by the sharp increase (94.1%) projected in the number of female farm workers for Canada. On the other hand, the much below-average increase (50.8%) projected for female employment in the Atlantic region is in line with the slow growth of its economy; while total employment increased by 36.8% in Canada from 1953 to 1966, it increased by only 22.6% in this region. In relation to the expected relative increases discussed above, one must bear in mind that there are large error margins attached to them, as can be seen from Table 74. For example, there is a 16% chance that the actual 1967-80 relative increase in the number of female production workers might, in fact, exceed 23%, due to unavoidable projection errors. The 1967-80 expected increase is 2.7%.

We shall now present intermediate projections on female employment for the years 1970 and 1975.

Female Employment in 1970 and 1975

Table 66 and Table 67 give intermediate projections for 1970 and 1975. Table 67 was used to derive the total employment projections used in Table 66 by the "production-productivity increases" method. An interesting result of Table 66 is the decline that is projected to take place between 1967 and 1970 in the number of female production workers (from 257,000 to 251,000) and in female employment in manufacturing (from 394,000 to 386,000) and their subsequent increase after 1970 to a higher level than in 1967: 263,000 female production workers and 410,000 female workers in manufacturing in 1975.

Earnings and Education in 1980

Table 68 shows that, when the 1961 percentage distribution of total female employment is applied to average earnings of 1961 for each occupation group so as to obtain a weighted average, the average annual earnings for employed female workers are \$1,930. On the other hand, between 1961 and 1980, the relative importance of some occupation groups with higher-than-average earnings (professionals and technicians, for instance) should increase while that of occupation groups with lower-than-average earnings should decline (for example, saleswomen and production workers). This should, undoubtedly, have the effect of increasing the average earnings for all employed female workers. Then, we see that, if a weighted average is calculated by applying the 1980 projected percentage distribution of total female employment to average earnings of 1961 for each occupation group, we obtain average annual earnings of \$2,136 for all employed women. This is an increase of 10.7% over the 1961 average earnings of \$1,930.

In other words, the change alone which is projected to take place in the percentage distribution of total female employment between 1961 and 1980 should make for an increase of 10.7% in the average annual earnings of employed women.

Evidently, the overall increase in average earnings will be larger, since average earnings for each occupation group will have increased between 1961 and 1980. The above-mentioned increase refers only to the result that, in 1980, proportionately more women than in 1961 should be working in relatively high-paid occupations.

Table 69 shows for 1980 the number of female workers in each occupation group who should have a complete secondary education or more and those who should have a complete university education. This is calculated by applying to the 1980 projected total number of women in each occupation group the proportion of women who, in 1961, had complete secondary education and that of women who had a complete university education. We see that if these proportions were to remain constant from 1961 to 1980, the change alone in the percentage distribution of total female employment would make for the following changes in the overall educational level of female workers: the proportion of female workers who have a complete secondary education or more would increase from 34.0% in 1961 to 39.5% in 1980; the proportion of female workers who have a complete university education or more would increase from 2.7% in 1961 to 3.7% in 1980. These changes represent a somewhat "minimum" educational attainment of female workers in 1980 because the proportions themselves for each occupation group will evidently increase between 1961 and 1980 as the overall education level of the total female population of working age increases with time, so that the total educational attainment of female workers will be higher in 1980 than the proportions shown in Table 69 for "all occupations".

On the other hand, an interesting point to mention here is that if the 1961 proportions for each occupation group are considered as representing the minimum educational requirements of each occupation group (for example, if we make the assumption that at least 81.3% of all female professionals and technicians must have a complete secondary education), we can say that, given the percentage distribution of total female employment in 1980 (which is related to the needs of the 1980 economy), Table 69 gives the minimum educational requirements of total female employment for 1980 (39.5 and 3.7%

for secondary and university education, respectively, instead of 34.0 and 2.7% in 1961). It should be pointed out, however, that the minimum educational requirements of most occupation groups will likely increase from 1961 to 1980 because of technological change and the necessary upgrading of human skills that it implies. It is of course quite clear that if these proportions really constitute educational requirements, they should necessarily turn out to be educational attainments if our projections are to materialize.

Projection Errors on Female Employment

As in the case of the (mean) female labour force levels projected for 1980, (1) it is interesting to estimate the relative errors we can expect for the 1980 mean values of the female employment levels and unemployment rates derived earlier. Here again, we shall use the coefficient of variation that is, the ratio (in percent) of the standard error of an estimate over the value of the estimate in question, as an indicator of the relative projection error. Provided the error distribution can be approximated by a normal distribution, we can say that the 1980 actual mean value which is projected has a 68% chance of falling within the "confidence limits" expressed by the coefficient of variation. For example, if we project total female employment in Canada to reach the 4,000,000 (mean) level in 1980, and if we estimated our projection error to be in the realm of plus or minus 10%, then it follows that we expect (average) female employment in 1980 to be somewhere between 3,600,000 and 4,400,000 and that the odds in our favour are about 2 to 1.

Tables 70 - 72 and 74 contain the coefficients of variation of all equation parameters and projected values given in, respectively, Tables 59, 63 and 64. In general, the smaller the projected value, the greater the coefficient of variation which uses the value in the denominator. For example, Table 59 shows that the 1980 distribution projection for "other occupations" is 1.3% of all female employment, and Table 70 indicates the

(1) See pp. 45-46, "Projection Errors", above.

coefficient of variation to be 81% which seems to imply a huge error. However, 1.3% plus or minus 81% of 1.3% yields "68% confidence limits" of 1.3 ± 0.9 that is, a 0.4 to 2.2 interval about the 1.3% projected value. This example emphasizes that the relative error of a projection can be large or small on two counts: whether or not the absolute error is large (numerator), and/or whether or not the projected value (denominator) is small.

Tables 70 and 59 indicate that the "typical" relative error for female employment levels in the most important occupation groups, sectors of the economy and regions in Canada is about plus or minus 12%. The total female employment relative error has been estimated at plus or minus 10.7% in Table 72. Since the projected increase in the total female employment in Canada between 1967 and 1980 is 74.4%, this 10.7% error represents about 14% of the projected total female employment increase. In the case of the total female labour force projected for 1980, a 4.2% relative error had been calculated (Table 39); since the projected increase in the total female labour force in Canada between 1967 and 1980 is 73.1%, the 4.2% error represents less than 6% of the projected total female labour force increase. It therefore appears that our labour force projections are more reliable than our employment projections, provided past trends continue in both cases until 1980.

Table 71 provides the coefficients of variation pertaining to the production and employment variables. It is seen that the relative error on the 1980 projection of the total production of goods and services (Gross Domestic Product) has been estimated to be 7%. The error on productivity is shown to be 1.7% and the error in the female share of total employment was found to be 2.3%; it is 1.2% for the male share. Finally, a total employment error of 4.8% has been calculated from the corresponding regression equation results; however, a higher value is retained in Table 72 (8.4%) because we have chosen for our projections of employment the "production-productivity increases" method which yielded an

employment level only 0.3% higher than the one of the time-exponential model. (1)

Table 72 reproduces some of the results of Tables 71 and 39; from those, relative errors are obtained for total employment (8.4%, as mentioned above), female employment (10.7%, as used in Table 70), male employment (9.6%) and unemployment levels and rates.

The relative errors on the projected 1980 unemployment rates (Parts C and D of Table 72) are necessarily the largest obtained in this study, since they reflect all the other errors made on labour force and employment predictions and that they are obtained through the much smaller denominator of unemployment (labour force minus employment). However, since unemployment predictions are not, as such, an objective in this study, the large relative errors obtained for the various unemployment rates do not matter much. The only concern one might have is that the projected unemployment rates might be misused if attention is not paid to the errors of estimation. Typically, for females, the unemployment rate in 1980 might be anywhere between -12% and + 14%, which means that the unemployment projections are meaningless except to make us realize that the negative rate originally obtained for the Atlantic Region was not significant. This is why we have revised the employment projections for the Regions, the errors being larger for employment projections than for labour force projections (see Table 64, Parts D and E, and Table 72, Part D). Similar remarks hold for all of our projections and particularly for our relative increases projections which have wide confidence limits, as shown in Table 74. The following Appendix gives more details about the formulae used to compile the various error margins affecting our predictions.

(1) See p. 61, above.

APPENDIX (1)

NOTES ON THE ECONOMETRIC METHODS USED

Introduction

The Royal Commission on the Status of Women in Canada, recognizing the principle that its recommendations must take into account what the future is likely to be, has commissioned the present study into the 1980 market conditions for female labour in Canada.

In order to make predictions, it is customary to develop a model of the system under study. We shall now introduce a few concepts pertaining to econometric models and methods which lead to such predictions. (2)

Nature of an Econometric Model

An econometric model is a more or less simplified mathematical representation of the behaviour of a given economic (sub-) system. It results from the mutual and sometimes tedious adaptation of adjusted statistical data (time-series, in this case), not always easily accessible, and of hypothetical economic relationships.

Once completed, an econometric model lends itself equally well to logical reasoning and to quantitative treatment. It is then that the statistically useful (or significant) model is submitted to the test of forecasting, a good model being one that can predict well. Depending upon the broadness of its objectives, a model can also be used to simulate economic policies; it can even at times contribute new knowledge to economic theory. It is not only a research tool, it is the embodiment of the scientific approach itself when used properly.

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- (1) This appendix is rather technical and might be omitted, at least in part, by readers not specifically concerned with methodological aspects.
- (2) Most of the basic concepts outlined in this appendix can be found in Johnston, J., "Econometric Methods", McGraw-Hill, New York, 1963, 300 pages, and in Theil, H., and Nagar, A.L., "Testing the Independence of Regression Disturbances", Journal of the American Statistical Association, 56 (1961), pp. 793-806.

An econometric model is expressed as a series of equations containing endogenous and exogenous variables. An endogenous variable is generated within the system for which the model is built; it depends upon other variables, exogenous or endogenous, and may correspond or not to an economic objective. It therefore requires an explanatory equation. An exogenous variable is produced outside of the economic system under study and may correspond or not to an economic instrument; it can be of a varied nature: economic, demographic, social, political, scientific, stochastic, and so on. An exogenous variable does not require an explanatory equation since it is not influenced by any other variable within the system.

In order to control the size of an econometric model or because of lack of data, econometricians sometimes have to consider as exogenous a variable which is not exactly so. (1) For the purpose of the present study, all independent (or explanatory) variables in each equation were considered as exogenous; since they were, therefore, taken as predetermined, the question of simultaneous-equation problems did not arise as such, that is, the parameters in each equation could be estimated independently of those in the other equations. Therefore, all our "endogenous" variables could simply be called "dependent" variables. However, reconciliations had to be made between the female labour force participation rates by marital status, region and age group in order to obtain a consistent total female labour force participation rate. (2) Revisions in projections were also effected for female employment and unemployment by region. Such corrections constitute a normal procedure; moreover, corrected values fell within the "confidence limits" (to be defined later) of the original values.

(1) Cf. p. 141 of Brown, T.M., "Canadian Economic Growth", Royal Commission on Health Services, Queen's Printer and Controller of Stationery, Ottawa, 1965, 316 pages.

(2) The three groups weighted averages of predictions yielding different results, as shown in Table 21.

Steps in the Construction of an Econometric Model

The main steps leading to the construction of an econometric forecasting model of the nature of the one used in this study are as follows: (1)

- 1-Choice of the dependent variables to be predicted.
- 2-Draft of a (stochastic) equation for each dependent variable, taking into account previous work in the field and incorporating theoretical considerations.
- 3-In conjunction with 1 and 2, above, collection of all pertinent time-series, often seasonally adjusted and/or expressed in constant dollars in the case of "price-quantity" variables. This reduces the number of parameters to be estimated (2). It is to be noted that seasonally adjusted data were not available for quarterly female participation rates by marital status. A dummy variable was used for each of the second, third and fourth quarters of each year: the value assigned was "1" for the quarter in question and "0" otherwise (3).
- 4-Estimation of the equation parameters (coefficients) by appropriate econometric methods, that is, taking into account the assumptions underlying these methods. A certain number of problems (4) can be encountered such as, for example,
 - a) Interdependent endogenous variables, that is, endogenous variables on both sides of the equations, thus requiring a "simultaneous" estimation of parameters (e.g. by two-stage least squares). We have not met this problem since all explanatory variables were postulated to be predetermined (that is, not endogenous in the current period).

(1) Cf. p. 6 of Duesenberry, J.S., Fromm, G., Klein, L.R., Kuh, E., et al., "The Brookings Quarterly Econometric Model of the United States", North-Holland Publishing Company, Amsterdam, 1965, 792 pages.

(2) Cf. Duesenberry et al., op. cit., pp. 30-31.

(3) Cf. Johnston, op. cit., pp. 221-228.

(4) Cf. Johnston, op. cit., Chapters 6-10.

b) Multicollinearity or correlation between independent variables in an equation. We have avoided, as much as possible, to introduce correlated independent variables and have used quarterly data in order to increase the number of observations and, therefore, reduce the variance of estimates of parameters.

c) Autocorrelated disturbances yielding predictions with needlessly large sampling variances and serious underestimation of the sampling variances of the regression coefficients. The method of estimation which was used in the present study either solved this problem completely or brought it down to a minor one. We shall soon come back on this subject.

- 5- Put the various estimated equations to the test of predicting outside the sample already used and verify the coherence of estimates with sources of information untapped during the construction of the model. For female labour force participation rates, this was done by comparing the 1980 predicted values of the selected dependent variables with the corresponding Economic Council of Canada projections. Female employment projections were then cross-checked with labour force projections to see if the resulting unemployment rates were as could be expected. As explained earlier, revisions were made for employment and unemployment values for the regions because of the negative female unemployment rate obtained in the case of the Atlantic Region. (1)
- 6-Allow for a periodic revision of the model since the economic system represented by the econometric model is subject to change, implying that certain portions of the model are progressively, and sometimes significantly, moving away from reality. An econometric model can thus be compared to an automated machine for which a maintenance program must be planned and executed and for which a replacement policy must be derived. Since this particular study has reached its deadline, it will not likely be required of the writers to up-date their model and projections.

(1) See p. 70, above.



However, there is sufficient material in the present paper to allow most economists to judge if the model is deteriorating and to rejuvenate it if it appears to be the case in (say) 1972 or 1976.

There is no doubt that the model given in this study will be up for replacement by 1980, especially for the female participation rate equations since the total female participation rate will likely be very close to what might presently be called an "engineered standard": 45%, the female labour force participation rate projected for 1980 in the United States of America (by the B.L.S.).

As enhanced by Theil, (1) forecasting of a long-term nature must be brought about if an optimal policy is to be obtained, but since revisions of long-term forecasts can be effected periodically (every year, for instance), the consequences of projection errors are greatly alleviated. Concerning the projections given in the present study, we would recommend that they be revised in the light of new information by any reader wanting to use them after (say) 1972, or earlier, depending upon the degree of reliability required.

Multiple Regression Analysis

Two types of equation structures were used in this study: (a) linear equations in one or more independent variables and, (b) exponential equations with time being the independent variable. Exponential equations were transformed into simple linear equations by expressing both sides of each equation in logarithms. The result was in fact a semi-logarithmic form with the dependent variable, expressed in logarithms, as a linear function of time.

The problem that had to be solved for each hypothetical line was the estimation of its "slope (s)" and intercept, from a given set of observations (or sample). In the case of only one independent variable, one could attempt to fit a line visually through the observation points shown on a scattergram.

(1) Theil, Henri, "Economic Forecasts and Policy", 2nd edition, revised, North-Holland Publishing Company, Amsterdam, 1961.

Such a simple procedure is useful to evaluate if the specification of "linearity" appears to be well founded, or whenever a mathematical relation must be obtained rapidly, at low cost and without too much concern for statistical inference problems.

The common mathematical approach to the estimation of equation parameters is "regression analysis" or "least squares". In this method, a "best line of fit" is obtained and corresponds to the line which yields the least sum of squares of residual errors about it, a residual error, or disturbance, being the difference between a given observed value of the dependent variable and its calculated value from the regression line. Figures 49 (linear structure) and 50 (exponential structure) show an assortment of scattergrams and corresponding regression lines calculated by a method which tackles the problem of positive autocorrelation of disturbances that is, the tendency of consecutive observations to linger on one side of a regression line, a phenomenon which is well illustrated in Figure 50, since time is the only independent variable. We shall now outline the econometric method which we had to use because of the presence of serial correlation. (1)

Estimation Method Dealing with Autocorrelated Disturbances

The following iterative procedure was used for each equation in the model: (2)

- 1- Least squares were applied in the usual way and the presence of autocorrelated disturbances was tested with the well-known (3) Durbin-Watson d statistic (see Table 73).

(1) For this problem of autocorrelation, cf. Johnston, op. cit., pp. 177-199 and Theil and Nagar, op. cit., pp. 793-806.

(2) Cf. Johnston, op. cit., pp. 192-195. A stepwise computer program for multiple regression analysis was modified and augmented in order to automate the procedure; modified Mureg (Cornell Computing Center, July 64).

(3) Cf. Theil and Nagar, op. cit., pp. 793-806.

2- Whenever the value of the Durbin-Watson d statistic was indicative of serial correlation, (1) - and it was always positive autocorrelation in our study, - a least squares regression was computed with the disturbance at time t being the dependent variable and the disturbance at time t minus one being the independent variable. An observation was lost in this way and the resulting "slope" gave an estimate of the autocorrelation coefficient (ρ) of an assumed first-order autoregressive (Markov) scheme of the disturbance. Estimated values of ρ ranged mostly between 0.4 and 0.8, as can be seen from Table 73 which shows two methods of estimation for ρ .

3- The estimate of ρ was then used to transform the original values of the variables by subtracting ρ times the value of a given variable at time t minus one from its value at time t . The result was something greater than a "first difference" since ρ is a fraction, by definition. Simple least squares were again applied to estimate the parameters of the relation between the transformed variables. It is to be noted that the slope (s) obtained from a regression on transformed variables are actually estimates of the coefficients in the untransformed hypothetical relation; the intercept value has simply to be divided by "one minus ρ " to achieve the same goal.

(1) Cf. pp. 427-431 of Malinvaud, Edmond, "Méthodes statistiques de l'économétrie", Dunod, Paris, 1964, 634 pages. For sake of simplicity, the Durbin-Watson test-statistic (BLU-procedure) was preferred to more powerful procedures (e.g. Blus), also based on the Von Neumann ratio, and presented in papers originating from the Econometric Institute of the Netherlands School of Economics. See note (1) next page.

The residuals from this second relationship were usually (1) not significantly autocorrelated and the estimation procedure could stop at that stage. The (near) random set of disturbances that had resulted enabled us to use unbiased towards zero sampling variances of the estimates for valid statistical significance tests and assured efficient predictions, that is, predictions with smaller sampling variances and "confidence limits" (error margins). The next 16 pages provide a detailed example of the computerized procedure which was used. The particular example deals with the case of the Canadian female labour force participation rate for the 25-44 age group. (2)

(1) See Table 73. The significance of the calculated Durbin-Watson d statistic was tested against the significance points of the Von Neumann Ratio given in the article by Theil and Nagar, *op. cit.*, p. 802, and which are equivalent to the d upper limits (d_u) calculated (pp. 173-175) by Durbin J. and Watson, G.S., "Testing for Serial Correlation in Least Squares Regression, II", *Biometrika*, 38 (1951), pp. 159-178. Recent work on this subject can be found in Theil, H., "The Analysis of Disturbances in Regression Analysis", *Journal of the American Statistical Association*, 60 (1965), pp. 1067-1079, and in Koerts, J., "Some Further Notes on Disturbance Estimates in Regression Analysis", *J.A.S.A.*, 62 (1967), pp. 169-183.

(2) See also the scattergram and regression line shown in the middle of Figure 49 and the 25-44 age group line in Table 20. The general model was formulated mathematically in the footnote to page 19; in this example, the variation in the Gross National Product was tried instead of the variation in female employment.

(L = labour force ; P = population ; L/P = participation rate)

Obs.	Z (1)	Z (2)	Z (3)	Z (4)	Z (5)
43	3.16000+001	2.90000+000	4.30000+001	7.84000+001	1.00000+001
44	3.16000+001	2.90000+000	4.30000+001	7.84000+001	1.00000+001
45	3.16000+001	2.90000+000	4.30000+001	7.84000+001	1.00000+001
46	3.16000+001	1.50000+000	6.80000+001	7.84000+001	1.00000+001
47	3.16000+001	1.50000+000	6.80000+001	7.84000+001	1.00000+001
48	3.20000+001	2.90000+000	4.30000+001	7.84000+001	1.00000+001
49	3.20000+001	1.50000+000	6.80000+001	7.84000+001	1.00000+001
50	3.20000+001	2.90000+000	4.30000+001	7.84000+001	1.00000+001
51	3.20000+001	1.50000+000	6.80000+001	7.84000+001	1.00000+001
52	3.20000+001	2.90000+000	4.30000+001	7.84000+001	1.00000+001
53	3.20000+001	1.50000+000	6.80000+001	7.84000+001	1.00000+001
54	3.44000+001	2.90000+000	4.30000+001	7.84000+001	1.00000+001
55	3.44000+001	1.50000+000	6.80000+001	7.84000+001	1.00000+001
56	3.44000+001	2.90000+000	4.30000+001	7.84000+001	1.00000+001
57	3.44000+001	1.50000+000	6.80000+001	7.84000+001	1.00000+001
58	3.44000+001	2.90000+000	4.30000+001	7.84000+001	1.00000+001

— 1967 (third quarter)

Z (1) = female labour force participation rate (in %) for the 25-44 age group in Canada; dependent variable (FTR).

Z (2) = percentage variation in Gross National Product (constant 1957 dollars); independent variable (Δ GNP/GNP).

Z (3) = time (quarterly data); independent variable: t=1 in 1953-II and reaches 58 in 1967-III (58 observations).

Z (4) = total male labour force participation rate for Canada; independent variable (MPR).

Z (5) = percentage variation in Z (4); independent variable (Δ MPR/MPR).

RESIDUALS

Y = Z (1)

	Y	Y - Y ₀	Y - Y ₀ (1)	DIFFERENCE	SQUARED	FIRST DIFFERENCES	SQUARED
1	2,31,00+01	2,31,00+01	2,31,00+01	1,13,27+00	1,34,44+00	0,0,00+00	0,0000+00
2	2,30,00+01	2,30,00+01	2,30,00+01	1,13,50+00	1,27,34+00	-2,41,74+02	5,84423+04
3	2,29,00+01	2,29,00+01	2,29,00+01	1,14,53+01	2,01,45+01	-6,42,17+01	3,03,96+01
4	2,28,00+01	2,28,00+01	2,28,00+01	0,17,14+01	4,07,21,73+01	1,77,23+01	3,03,16+01
5	2,27,00+01	2,27,00+01	2,27,00+01	1,02,73+01	2,05,33+02	-5,42,17+01	2,97,73+01
6	2,26,00+01	2,26,00+01	2,26,00+01	0,30,73+01	1,14,73+01	1,77,23+01	3,03,16+01
7	2,25,00+01	2,25,00+01	2,25,00+01	2,01,45+01	4,05,33+02	-1,77,23+01	1,03,16+01
8	2,24,00+01	2,24,00+01	2,24,00+01	0,02,53+01	4,03,11+01	0,0,00+00	1,03,16+01
9	2,23,00+01	2,23,00+01	2,23,00+01	1,03,74+01	2,75,27+01	3,75,23+01	1,41,48+01
10	2,22,00+01	2,22,00+01	2,22,00+01	1,03,74+01	2,40,32+01	-3,75,23+01	1,41,48+01
11	2,21,00+01	2,21,00+01	2,21,00+01	0,18,71+01	2,40,32+01	-3,75,23+01	1,41,48+01
12	2,20,00+01	2,20,00+01	2,20,00+01	0,18,71+01	3,03,31+01	-2,41,73+01	2,03,23+01
13	2,19,00+01	2,19,00+01	2,19,00+01	0,18,71+01	1,12,32+01	7,55,23+02	5,67,45+02
14	2,18,00+01	2,18,00+01	2,18,00+01	0,32,34+01	1,07,31+01	-2,75,23+01	1,03,23+01
15	2,17,00+01	2,17,00+01	2,17,00+01	0,02,53+01	1,25,74+01	-2,01,74+02	3,03,23+01
16	2,16,00+01	2,16,00+01	2,16,00+01	0,02,53+01	7,07,13+02	7,05,23+02	5,07,45+02
17	2,15,00+01	2,15,00+01	2,15,00+01	0,70,00+02	0,01,71+01	3,75,23+01	1,41,48+01
18	2,14,00+01	2,14,00+01	2,14,00+01	1,02,71+01	1,01,16+01	-2,41,73+01	2,03,23+01
19	2,13,00+01	2,13,00+01	2,13,00+01	1,02,71+01	2,02,11+01	2,75,23+01	1,03,23+01
20	2,12,00+01	2,12,00+01	2,12,00+01	1,02,71+01	1,03,31+01	1,0,00+00	1,03,23+01
21	2,11,00+01	2,11,00+01	2,11,00+01	0,42,34+01	0,03,31+01	0,0,00+00	0,0000+00
22	2,10,00+01	2,10,00+01	2,10,00+01	1,01,73+01	0,03,31+01	0,0,00+00	0,0000+00
23	2,09,00+01	2,09,00+01	2,09,00+01	0,03,31+01	0,03,31+01	0,0,00+00	0,0000+00
24	2,08,00+01	2,08,00+01	2,08,00+01	0,03,31+01	0,03,31+01	0,0,00+00	0,0000+00
25	2,07,00+01	2,07,00+01	2,07,00+01	0,03,31+01	0,03,31+01	0,0,00+00	0,0000+00
26	2,06,00+01	2,06,00+01	2,06,00+01	0,03,31+01	0,03,31+01	0,0,00+00	0,0000+00
27	2,05,00+01	2,05,00+01	2,05,00+01	0,03,31+01	0,03,31+01	0,0,00+00	0,0000+00
28	2,04,00+01	2,04,00+01	2,04,00+01	0,03,31+01	0,03,31+01	0,0,00+00	0,0000+00
29	2,03,00+01	2,03,00+01	2,03,00+01	0,03,31+01	0,03,31+01	0,0,00+00	0,0000+00
30	2,02,00+01	2,02,00+01	2,02,00+01	0,03,31+01	0,03,31+01	0,0,00+00	0,0000+00
31	2,01,00+01	2,01,00+01	2,01,00+01	0,03,31+01	0,03,31+01	0,0,00+00	0,0000+00
32	2,00,00+01	2,00,00+01	2,00,00+01	0,03,31+01	0,03,31+01	0,0,00+00	0,0000+00
33	2,00,00+01	2,00,00+01	2,00,00+01	0,03,31+01	0,03,31+01	0,0,00+00	0,0000+00
34	2,00,00+01	2,00,00+01	2,00,00+01	0,03,31+01	0,03,31+01	0,0,00+00	0,0000+00
35	2,00,00+01	2,00,00+01	2,00,00+01	0,03,31+01	0,03,31+01	0,0,00+00	0,0000+00
36	2,00,00+01	2,00,00+01	2,00,00+01	0,03,31+01	0,03,31+01	0,0,00+00	0,0000+00
37	2,00,00+01	2,00,00+01	2,00,00+01	0,03,31+01	0,03,31+01	0,0,00+00	0,0000+00
38	2,00,00+01	2,00,00+01	2,00,00+01	0,03,31+01	0,03,31+01	0,0,00+00	0,0000+00
39	2,00,00+01	2,00,00+01	2,00,00+01	0,03,31+01	0,03,31+01	0,0,00+00	0,0000+00
40	2,00,00+01	2,00,00+01	2,00,00+01	0,03,31+01	0,03,31+01	0,0,00+00	0,0000+00
41	2,00,00+01	2,00,00+01	2,00,00+01	0,03,31+01	0,03,31+01	0,0,00+00	0,0000+00

42	2.88000+001	3.11340+001	-2.31406-001	5.35903-002	7.75625-001	6.01905-001
43	3.13000+001	3.13370+001	2.44829-001	5.90863-002	4.75325-001	2.23410-001
44	3.21000+001	3.11748+001	5.29154-001	2.75361-001	2.75325-001	7.60795-002
45	3.16000+001	3.16040+001	-2.04020-001	4.19243-002	-7.24175-001	5.24429-001
46	3.16000+001	3.24232+001	-4.28195-001	1.83351-001	-2.24175-001	5.23544-002
47	3.15000+001	3.22524+001	-4.52370-001	2.04639-001	-2.41748-002	5.24423-004
48	3.20000+001	3.24765+001	-4.76545-001	2.27095-001	-2.41748-002	5.24423-004
49	3.23000+001	3.27607+001	1.99280-001	3.97126-002	6.75825-001	4.55740-001
50	3.25000+001	3.29249+001	-4.24895-001	1.80535-001	-6.24175-001	3.08594-001
51	3.31000+001	3.31491+001	-4.90695-002	2.40731-003	3.75825-001	1.41245-001
52	3.37000+001	3.33732+001	3.26755-001	1.06769-001	3.75825-001	1.41245-001
53	3.38000+001	3.35974+001	2.02591-001	4.10390-002	-1.24175-001	1.54194-002
54	3.44000+001	3.38216+001	3.78406-001	3.34553-001	3.75825-001	1.41245-001
55	3.50000+001	3.40458+001	9.54231-001	9.10557-001	3.75825-001	1.41245-001
56	3.55000+001	3.42699+001	1.23006+000	1.51304+000	2.75825-001	7.60795-002
57	3.52000+001	3.44941+001	7.05381-001	4.98269-001	-5.24175-001	2.74759-001
58	3.59000+001	3.47183+001	1.18171+000	1.39643+000	4.75825-001	2.26410-001

DURBIN-WATSON STATISTIC
4.85551-001

Since the Durbin-Watson statistic $d = 0.486$, this is indicative of autocorrelation. We therefore proceed with the calculation of Rho.

DATE 1/8/74

Residuals

(one observation is lost in the autoregressive scheme)

SUMMARY OF RESULTS

1.15267400 -1.151711+00

UNCONSTRAINED SUM OF SQUARES AND CROSS-PRODUCTS

1.42151+001 1.44572+001

1.44572+001 1.42342+001

RESTRICTED SUM OF SQUARES

2.13451+00 -2.07317+02

CONSTRAINED SUM OF SQUARES AND CROSS-PRODUCTS

1.42122+001 1.44532+001

1.44532+001 1.42297+001

STANDARD DEVIATIONS

5.01111+001 5.04263+001

CORRELATION COEFFICIENTS

1.91230+009 7.33437+001

7.33437+001 1.00000+000

Q.S. Z(1) Z(2) --- 1953-III for Z (1) and 1953-II for Z (2)

1	1,135,640.00	1,135,640.00
2	3,113,230.01	1,135,640.00
3	5,113,230.01	5,113,230.01
4	1,623,730.01	6,871,430.01
5	3,337,910.01	1,623,730.01
6	2,146,240.01	3,337,910.01
7	2,146,240.01	2,146,240.01
8	1,623,730.01	2,146,240.01
9	1,579,610.01	1,623,730.01
10	1,579,610.01	1,579,610.01
11	1,579,610.01	1,579,610.01
12	3,337,910.01	1,623,730.01
13	3,337,910.01	3,337,910.01
14	6,777,910.01	3,337,910.01
15	3,337,910.01	3,337,910.01
16	1,579,610.01	3,337,910.01
17	1,579,610.01	1,579,610.01
18	3,337,910.01	1,579,610.01
19	1,579,610.01	3,337,910.01
20	7,617,910.01	1,579,610.01
21	3,337,910.01	7,617,910.01
22	5,721,740.01	5,721,740.01
23	3,337,910.01	5,721,740.01
24	3,337,910.01	3,337,910.01
25	3,337,910.01	3,337,910.01
26	3,337,910.01	3,337,910.01
27	3,337,910.01	3,337,910.01
28	3,337,910.01	3,337,910.01
29	3,337,910.01	3,337,910.01
30	3,337,910.01	3,337,910.01
31	3,337,910.01	3,337,910.01
32	3,337,910.01	3,337,910.01
33	3,337,910.01	3,337,910.01
34	3,337,910.01	3,337,910.01
35	3,337,910.01	3,337,910.01
36	3,337,910.01	3,337,910.01
37	3,337,910.01	3,337,910.01
38	3,337,910.01	3,337,910.01
39	3,337,910.01	3,337,910.01
40	3,337,910.01	3,337,910.01
41	3,337,910.01	3,337,910.01
42	3,337,910.01	3,337,910.01

OLS:	Z (1)	Z (2)
43	5.20154-001	2.44323-001
44	-2.04020-001	5.20154-001
45	-4.23195-001	-2.04020-001
46	-4.52370-001	-4.23195-001
47	-4.76545-001	-4.52370-001
48	1.99220-001	-4.76545-001
49	-4.24695-001	1.99220-001
50	-4.90695-002	-4.24695-001
51	3.26725-001	-4.90695-002
52	2.02581-001	3.26725-001
53	5.78406-001	2.02581-001
54	9.54231-001	5.78406-001
55	1.23-00+000	9.54231-001
56	7.05881-001	1.23-00+000
57	1.15171+000	7.05881-001

--- 1967-III for Z (1) and 1967-II for Z (2)°.

Z (1) = residuals at time t; dependent variable (u_t)

Z (2) = residuals at time t-1; independent variable (u_{t-1})

STEPWISE REGRESSION CASE 0

DEPENDENT VARIABLE 1

F-LEVEL TO ENTER 3.00000

F-LEVEL TO REMOVE 3.00000

STANDARD ERROR OF Y 0.50515

STEP NO. 1

ENTERED VARIABLE 2

F-LEVEL 34.02240

STD ERROR OF EST Y 0.34652

MULTIPLE CORRELATION 0.73344

ASSUMED 0.53793

DEGREES OF FREEDOM 55

CONSTANT TERM -0.00511

VARIABLE	DETA PRIME	BETA	SE (BETA)
(u) 2	7.33437-001	7.34787-001	9.18273-002

t-1

BETA = estimate of Rho $\hat{=}$ 0.735.

This estimate of Rho is now used to transform the original data: value at time t minus Rho times value at time t-1, for each variable.

(one observation is lost in the transformation process).

OBSERVATIONS 57

SUM OF SQUARES

4.29493+002 1.26536+001 4.99337+002 1.29839+003 -1.36666+000

UNCORRELATED SUM OF SQUARES AND CROSS-PRODUCTS

3.44997+003 1.00042+002 4.07472+003 9.28129+003 -1.03973+001
1.00042+002 1.39256+002 1.21666+002 2.66711+002 -5.66296+001
4.07472+003 1.21666+002 5.39075+003 1.03884+004 -1.22999+001
9.28129+003 2.66711+002 1.03884+004 2.66322+004 -2.65230+001
-1.03973+001 -2.65230+001 -1.22999+001 -2.65230+001 6.35593+000

MEAN OF VARIABLES

7.70263+000 2.21996+001 8.69117+000 2.11996+001 -2.40116+002

CORRELATED SUM OF SQUARES AND CROSS-PRODUCTS

6.81317+001 2.37881+000 2.52366+002 -2.64636+001 1.45259+001
2.37881+000 1.36449+002 1.16310+001 -1.54269+000 -3.62463+001
2.52366+002 1.16310+001 1.05517+003 -1.13890+002 -4.03725+001
-2.64636+001 -1.54269+000 -1.13890+002 1.46764+001 2.48723+000
1.45259+001 -3.62463+001 -4.03725+001 2.48726+000 6.32233+000

STANDARD DEVIATIONS

1.10261+000 1.55995+000 4.4205+000 5.11936+001 3.36006+001

CORRELATION COEFFICIENTS

1.00000+000 2.67148+002 3.52030+001 -8.36881+001 6.99884+003
2.67148+002 1.00000+000 3.62256+002 -3.44732+002 -1.91499+002
3.52030+001 3.62256+002 1.00000+000 -9.52453+001 -4.87411+003
-8.36881+001 -3.44732+002 -9.52453+001 1.00000+000 2.58209+001
6.99884+003 -1.91499+002 -4.87411+003 2.58209+001 1.00000+000

015	Z(1)	Z(2)	Z(3)	Z(4)	Z(5)
1	0.136441+000	-2.66342+000	1.22221+000	2.15127+001	1.40272-001
2	5.77326+000	-7.92038-002	1.53843+000	2.14594+001	-3.72864-001
3	0.67327+000	-3.27455+000	1.72504+000	2.15270+001	4.60726-002
4	5.67946+000	1.63107+000	2.66005+000	2.20474+001	6.93915-001
5	5.45255+000	1.34650+000	2.31606+000	2.16270+001	-5.93313-001
6	6.36595+000	1.18255-001	2.52125+000	2.18749+001	3.20425-001
7	0.03250+000	1.35521+000	2.65648+000	2.12005+001	-7.34787-002
8	5.77946+000	4.35695+000	3.12170+000	2.15005+001	-3.00000-001
9	6.23258+000	-3.93524+000	3.33691+000	2.17474+001	2.20436-001
10	5.51206+000	-2.12670+000	3.55213+000	2.16474+001	1.00000-001
11	6.66511+000	4.40827+000	3.91734+000	2.16740+001	-1.73479-001
12	6.44467+000	-1.14523+000	4.13255+000	2.18474+001	1.73479-001
13	6.64467+000	9.78191-002	4.44777+000	2.20740+001	3.26521-001
14	0.78771+000	-1.81743-001	4.71296+000	2.17535+001	-3.93915-001
15	7.17728+000	6.85642-001	4.97819+000	2.17275+001	-2.65213-002
16	6.73640+000	-1.78174+000	5.24340+000	2.18005+001	7.34787-002
17	7.23640+000	2.16131+000	5.50662+000	2.20005+001	2.00000-001
18	7.26901+000	-2.60210+000	5.77303+000	2.16535+001	-4.46757-001
19	6.67819+000	1.64914+000	6.03900+000	2.12005+001	2.20436-001
20	7.39585+000	1.10602+000	6.30425+000	2.15005+001	-4.00000-001
21	6.62414+000	-3.23702-001	6.55947+000	2.09209+001	-7.06085-001
22	7.12215+000	1.85649-001	6.83468+000	2.17005+001	9.24767-001
23	7.37509+000	2.85649-001	7.09939+000	2.15615+001	-1.46957-001
24	7.16110+000	2.12170-001	7.39511+000	2.12613+001	-4.00000-001
25	7.60770+000	-4.87831-001	7.63032+000	2.14822+001	2.93915-001
26	7.14031+000	8.26521-001	7.89553+000	2.13822+001	-1.00000-001
27	7.41379+000	5.38691-001	8.16074+000	2.13557+001	-2.65213-002
28	7.76523+000	-2.39174+000	8.42596+000	2.14292+001	7.34787-002
29	7.99543+000	1.50213+000	8.69117+000	2.12292+001	-3.00000-001
30	8.15025+000	9.06085-001	8.95633+000	2.13761+001	2.20436-001
31	7.81769+000	-1.78174+000	9.22159+000	2.10761+001	-4.00000-001
32	7.94421+000	3.26131+000	9.40001+000	2.09966+001	-1.06085-001
33	7.19725+000	6.69553-001	9.75202+000	2.00170+001	-2.06085-001
34	6.13013+000	-5.10447-001	1.00172+001	2.09109+001	6.73936-002
35	7.67073+000	7.12973-002	1.02824+001	2.10579+001	2.20436-001
36	6.19725+000	1.91734-001	1.05477+001	2.09579+001	-1.00000-001
37	0.20334+000	6.52127-002	1.05129+001	2.07314+001	-3.26521-001
38	7.50290+000	2.12170-001	1.10731+001	2.05516+001	-2.06085-001
39	7.47582+000	5.12173-001	1.13433+001	2.09457+001	4.67394-001
40	6.07652+000	-8.26601-003	1.16085+001	2.06722+001	-3.73479-001
41	8.92966+000	5.12170-001	1.18737+001	2.06192+001	-7.95630-002
42	8.89507+000	2.09173+000	1.21309+001	2.00562+001	3.20436-001

O.S.	Z(1)	Z(2)	Z(3)	Z(4)	Z(5)
43	8.85072+000	6.69117+001	1.24441+001	2.05927+001	-3.73479+001
44	8.01933+000	-1.45740+000	1.26694+001	2.07396+001	2.20435+001
45	8.38072+000	1.15012+000	1.29345+001	2.07396+001	0.00000+000
46	8.66072+000	1.97019+001	1.31990+001	2.04390+001	-4.00000+001
47	8.63376+000	1.94478+000	1.34650+001	2.05601+001	1.93915+001
48	8.30321+000	-1.93039+000	1.37302+001	2.04335+001	3.73479+001
49	8.32590+000	2.59173+001	1.39934+001	2.05355+001	-2.20435+001
50	9.21941+000	-9.30083+001	1.42506+001	2.02666+001	-5.00000+001
51	9.37034+000	1.41025+000	1.45258+001	2.07805+001	5.67394+001
52	9.03707+000	-3.90011+001	1.47911+001	2.06335+001	-2.20435+001
53	9.56419+000	-7.27531+001	1.50363+001	2.06335+001	0.00000+000
54	9.72332+000	1.14696+000	1.53215+001	2.03335+001	-4.00000+001
55	9.76244+000	4.45213+001	1.55657+001	2.06561+001	3.93915+001
56	9.01150+000	1.92553+002	1.58519+001	2.06805+001	2.65213+002
57	1.61355+001	-1.36131+000	1.61171+001	2.07070+001	2.65213+002

— 1967-III minus (0.735) 1967-II

Z (1) = FPR in t minus Rho times FPR in t-1.

Z (2) = Δ GNP/GNP in t minus Rho times Δ GNP/GNP in t-1.

Z (3) = t minus Rho times (t-1) = (1-Rho) t + Rho.

Z (4) = MPR in t minus Rho times MPR in t-1.

Z (5) = Δ MPR/MPR in t minus Rho times Δ MPR/MPR in t-1.

DATE 12/25/64 -- Transformed variables

STEP 1: INITIAL CORRELATION COEFFICIENT 0

STEP 2: TEST FOR LINEARITY 1

F-LEVEL TO ENTER 3.00000

F-LEVEL TO REMOVE 3.00000

STANDARD ERROR OF Y 1.10301

STEP NO. 1
ENTERED VARIABLE 3 (only time is statistically significant and enters the regression)

F-LEVEL 539.25796
STD ERROR OF EST Y 0.34058
MULTIPLE CORRELATION 0.95203
R-SQUARED 0.90636
REPEATED OF F(1,109) 45
CONSTANT TERM 5.62937 = (1-Rho) * (true constant term)

VARIABLE BETA PRIME BETA SE (BETA)
(time) 3 9.52039-001 2.38548-001 1.93389-002
(SE (BETA) has more than doubled as compared to its value in the initial step, which shows that autocorrelation underestimates this value when not explicitly taken into account).

INVERSE CROSS-PRODUCT MATRIX (corrected)

9.21513-004

ANALYSIS OF VARIANCE			
TERM	SS	DF	MS
TOTAL	6.81317+001	56	
REG	6.17619+001	1	6.17619+001
ERR	6.37983+000	55	1.15997-001

Therefore FPR = (5.62937)/(1-Rho) + (0.238548) t.

Since 1-Rho $\hat{=}$ 1-0.735 = 0.265.

Then FPR $\hat{=}$ 21.2 + (0.239) t.

In 1980-II: FPR (25-44) = 21.2 + (0.239) (109) = 47.2% (original prediction).

RESIDUALS

$$Y = Z (1)$$

CASE NO.	Y-OBSERVED	Y-CALCULATED	DIFFERENCE	SQUARED	FIRST DIFFERENCES	SQUARED
1	6.33641+000	6.33114+000	3.95222-001	1.56218-001	0.00000+000	0.00000+000
2	6.77946+000	6.99999+000	-2.14991-001	4.62212-002	-5.14223-001	3.62373-001
3	6.47237+000	6.66771+000	-4.15568-001	1.72771-001	6.34648-001	3.57719-001
4	6.77946+000	6.12699+000	-2.41523-001	5.83334-002	-6.57181-001	4.31887-001
5	6.69959+000	6.14225+000	5.15647-001	9.95331-002	5.87176-001	3.40439-001
6	6.31599+000	6.24751+000	5.84562-002	3.41534-003	-2.57181-001	6.51420-002
7	6.32255+000	6.31073+000	-2.78279-001	7.74389-002	-3.28745-001	1.13397-001
8	6.77946+000	6.37400+000	4.05413-001	1.64436-001	6.83591-001	4.67434-001
9	6.25958+000	6.43731+000	-1.99725-001	3.94918-002	-6.04133-001	3.64983-001
10	6.51206+000	6.50156+000	1.14373-002	1.31956-004	2.10213-001	4.41894-002
11	6.65811+000	6.55334+000	1.01244-001	1.02544-002	8.97765-002	8.05983-003
12	6.44457+000	6.62711+000	-1.82436-001	3.32838-002	-2.83702-001	8.04869-002
13	6.56457+000	6.69037+000	-4.57044-002	2.08889-003	1.36734-001	1.86962-002
14	6.79771+000	6.75356+000	4.40722-002	1.54235-003	8.97765-002	8.05983-003
15	7.17723+000	6.51691+000	3.69370-001	1.29867-001	3.16293-001	1.00644-001
16	6.73640+000	6.88017+000	-1.43766-001	2.06694-002	-5.04133-001	2.54156-001
17	7.23640+000	6.94344+000	2.92265-001	8.58208-002	4.36734-001	1.90737-001
18	7.25991+000	7.00579+000	2.52306-001	6.66044-002	-3.85595-002	9.40014-004
19	6.67509+000	7.66927+000	-3.94375-001	1.55926-001	-6.57181-001	4.31887-001
20	7.33533+000	7.13324+000	2.62295-001	6.87936-003	6.57176-001	4.31873-001
21	6.62814+000	7.19650+000	-5.68364-001	3.23036-001	-8.30660-001	6.89995-001
22	7.12305+000	7.25977+000	-1.37716-001	1.89656-002	4.30649-001	1.85458-001
23	7.37595+000	7.32303+000	5.20610-002	2.71035-003	1.23777-001	3.60151-002
24	7.19118+000	7.30630+000	-2.05120-001	4.20742-002	-2.57181-001	6.61420-002
25	7.50770+000	7.44957+000	1.54135-001	2.50060-002	3.63255-001	1.31954-001
26	7.14031+000	7.51203+000	-3.72524-001	1.63774-001	-5.30660-001	2.81600-001
27	7.41379+000	7.57610+000	-1.62312-001	2.63450-002	2.10213-001	4.41394-002
28	7.76503+000	7.53935+000	1.27465-001	1.62473-002	2.89777-001	8.39704-002
29	7.59943+000	7.70263+000	2.99005-001	8.80934-002	1.69349-001	2.86762-002
30	6.15856+000	7.76590+000	3.92667-001	1.54187-001	9.58616-002	9.18945-003
31	7.81769+000	7.82916+000	-1.14714-002	1.31593-004	-4.04133-001	1.63328-001
32	7.94421+000	7.89243+000	5.17439-002	2.68157-003	6.32553-002	4.09123-003
33	7.19725+000	7.95569+000	-7.58440-001	5.75231-001	-8.10223-001	6.56462-001
34	6.15813+000	8.01286+000	1.19167-001	1.42007-002	8.77606-001	7.70193-001
35	7.87673+000	8.08223+000	-2.11493-001	4.47292-002	-3.30660-001	1.09236-001
36	6.19725+000	8.14549+000	5.17624-002	2.67935-003	2.63255-001	6.93033-002
37	8.20334+000	8.20876+000	-5.41452-003	2.93603-005	-5.71309-002	3.26866-003
38	7.80290+000	8.27202+000	-6.89121-001	4.74887-001	-6.83702-001	4.67449-001
39	7.87662+000	8.38529+000	-4.58472-001	2.10196-001	2.30649-001	5.31929-002
40	8.07002+000	8.39956+000	-3.21736-001	1.03515-001	1.36734-001	1.86962-002
41	8.92906+000	8.46192+000	4.68939-001	2.19060-001	7.89777-001	6.23747-001

42	8.5617+000	8.5293+000	3.6925-001	1.3689-001	-9.2353-002	9.61445-003
43	8.35072+000	8.50750+000	2.9286-001	5.54793-002	-7.75171-002	6.02441-003
44	8.61333+000	8.6515+000	-6.38251-001	4.97410-001	-2.30655-001	8.66127-001
45	8.5072+000	8.71658+000	-3.34164-001	1.11665-001	3.04120-001	9.24936-002
46	8.7172+000	8.77110+000	-1.97431-001	3.62793-002	1.39734-001	1.86962-002
47	8.23375+000	8.34148+000	-2.07553-001	4.31193-002	-1.02233-002	1.04519-004
48	8.2561+000	8.20455+000	4.02123-001	2.32443-001	6.63777-001	4.75792-001
49	8.2750+000	8.90795+000	-2.02451-001	4.12743-001	-1.12457+000	1.26467+000
50	8.31941+000	8.39122+000	1.83193-001	3.54182-002	8.33643-001	6.89978-001
51	8.3754+000	8.03655+000	2.14059-001	8.06297-002	9.50613-002	9.10945-003
52	8.5257+000	9.15778+000	-1.20079-001	1.44196-002	-4.04131-001	1.63328-001
53	8.56419+000	9.22101+000	3.43175-001	1.17770-001	4.63253-001	2.14605-001
54	8.72332+000	9.28425+000	4.39033-001	1.92754-001	9.53613-002	9.18945-003
55	8.73244+000	8.34755+000	4.34200-001	1.89130-001	-4.13637-003	1.71261-005
56	8.1155+000	8.41051+000	-2.95760-001	8.74740-002	-7.30669-001	5.33464-001
57	1.00355+001	8.47406+000	5.61410-001	3.15181-001	8.57170-001	7.34741-001

DURBIN-WATSON STATISTIC
d= 2.14396+000

The value of d shows no evidence of autocorrelation in the residuals (disturbances) obtained with transformed data.

We therefore have unbiased variance estimates and efficient predictions.

Significance Tests, Confidence Intervals and Prediction Problems

Statistical tests were carried out in order to present regression coefficients which were significant, at least at the 95% confidence level.

(1) This was automatically done by the computer program by giving it appropriate critical values (of F).

A measure of the variability of an estimate is given by its coefficient of variation which is the percentage ratio of the standard error of the estimate over the estimate. The computer printed the two values for each equation and we only had to divide one by the other and multiply by 100. (2) As seen from Tables 39, 70 and 71, coefficients of variation for parameters can predominantly be found in the 2-30% range, implying corresponding Student-t values from above 50 right down to 3 and 2. It should be noted that low coefficients of variation do occur more often for constant terms because there are no theoretical reasons for the intercepts to be near zero; this is not the case, however, for the estimated slopes. This is emphasized by the fact that several variables did not come out as significant, implying that there was no evidence in favour of a slope different from zero; the coefficients of variation in those cases would tend to be much higher than 50%, that is, Student-t values would fall in the 0-2 range. (4)

The main purpose of this study was to make predictions for 1980. It was therefore of interest to calculate coefficients of variation for our 1980 mean estimates, as opposed to individual estimates for which the coefficients of variation incorporate the standard error of the disturbances, and which are mostly used in short-term forecasting. (5)

(1) Cf. Johnston, op. cit., pp. 115-131.

(2) Except for the standard error of the constant term which had to be calculated with a desk-calculator. The formula used will be given below.

(3) Except for the intercept of the autoregressive scheme for disturbances.

(4) There were several estimates of Rho which were not statistically significant even if their corresponding d-values fell below the Von Neumann significance points and indicated serial correlation, as shown in Table 73.

(5) Cf. Johnston, op. cit., pp. 34-39 and 195-199.

The computer output first gave the estimated regression line of a given problem. In order to obtain a 1980 prediction ($c'\hat{B}$), we only had to multiply the equation parameters (\hat{B}) by the corresponding 1980 projected values of the independent variables (c'). (1)

Secondly, the standard error of the mean prediction could be calculated from the "inverse (corrected) cross-product matrix", $(x'x)^{-1}$, and the "standard error of estimate Y", (s), from the computer printed output, and the 1980 projected values of the independent variables (vectors c' and c). (2) The following formula was used to transform the printed $(x'x)^{-1}$ matrix into the $(X'X)^{-1}$ matrix required for the calculation of the prediction standard error: (3)

$$(X'X)^{-1} = \left[\begin{array}{c|c} (x'x)^{-1} & -(x'x)^{-1} \bar{X} \\ \hline -\bar{X}' (x'x)^{-1} & (1/n) + \bar{X}' (x'x)^{-1} \bar{X} \end{array} \right]$$

where \bar{X} (or \bar{X}') = vector of the averages of X, the independent variables;

n = number of observations. (4)

(1) To this value, it was not necessary to add Rho to the power n times the last residual error, n being the number of periods between the last observation and 1980, because it came out as negligible since Rho is always a fraction and n was 13 or 14 (annual data), or 50 (quarterly data). The same correction was also unnecessary for the confidence intervals, for the same reason. Such a correction would avoid a bias in the case of a short-term econometric forecast since it would predict a residual error generally different from zero (Rho times the last observed disturbance in the case of a forecast for the next period, with $n = 1$). Cf. Johnston, op. cit., pp. 195-199. \hat{B} = Beta.

(2) Cf. Johnston, op. cit., pp. 131-133. We are broadly using his notation.

(3) Cf. Malinvaud, op. cit., p. 194. Partitioned matrix configuration as in Malinvaud's book; in Johnston's book, the four elements would diagonally trade positions.

(4) In the case of an individual prediction (and not a mean prediction), the value "1" would appear before $(1/n)$ in "element" (2,2) of the matrix.

This transformation allows the use of the confidence interval formula (4-55) of Johnston (op. cit., p. 132):

$$c'\hat{B} \pm t_{e/2} \hat{s} \sqrt{c'(X'X)^{-1}c}$$

where $t_{e/2}$ = critical value of the Student-t distribution for a 100 (1-e) percent confidence interval for $c'\hat{B}$. We have chosen $t_{0.16} \doteq 1$ for (approximately) a 68% confidence interval. The latter has been expressed in the form of the coefficient of variation, that is,

$$c'\hat{B} \pm (100) \hat{s} \sqrt{c'(X'X)^{-1}c} / c'\hat{B}.$$

It is the results from the second member of this expression which are shown in Tables 39, 70 and 71 concerning the 1980 projections resulting directly from regression analysis.

Let us go back to the example given above for the 25-44 age group. We have

$$\hat{B} = \begin{bmatrix} \text{slope} \\ \text{intercept} \end{bmatrix} = \begin{bmatrix} 0.2385 \\ 5.63 \end{bmatrix}$$

from the computer output for transformed data;

$$c' = (\text{time } X_0) = (109 \quad 3.77)$$

$$\begin{aligned} \text{for 1980-II and where } X_0 &= 1/(1-\text{Rho}) \\ &= 1/(1-0.735) = 3.77 \end{aligned}$$

which is equivalent to setting intercept = $5.63/(1-\text{Rho}) = 21.2$

and $X_0 = 1$ (dummy variable for the constant term) for obtaining $c'\hat{B}$, (1)

the 1980-II original prediction of the 25-44 FPR:

$$c'\hat{B} = (109 \quad 3.77) \begin{bmatrix} 0.2385 \\ 5.63 \end{bmatrix} = 47.2;$$

$$(X'X)^{-1} = 0.000921513$$

the inverse (corrected) cross-product matrix given by the computer print-out;

$$\bar{X} = 8.69117 \quad (X = Z \text{ (3) in computer notation})$$

the average value of time (transformed); and

(1) In vector c' , the value for the constant term dummy variable (X_0) is at the far-right, here, instead of at the far-left, as in Johnston's notation.

$n = 57$ observations. It follows that

$$(X'X)^{-1} = \begin{bmatrix} 0.000922 & -0.008013 \\ -0.008013 & 0.087186 \end{bmatrix}$$

using the above formula and results. Making the necessary computations, we obtain:

$$\begin{aligned} \sqrt{c' (X'X)^{-1} c} &= 2.86 \quad \text{and} \\ \hat{s} \sqrt{c' (X'X)^{-1} c} &= (0.34058) (2.86) \\ &= 0.974 \end{aligned}$$

since $\hat{s} = 0.34058$ (Std error of est Y).

The coefficient of variation for the 25-44 age group FPR in 1980 is therefore:

$$\frac{100 \hat{s} \sqrt{c' (X'X)^{-1} c}}{c' \hat{B}} = \frac{100 (0.974)}{47.2} = 2.1\%$$

as given in Table 39 (Age Group-I).

For the constant term, the formula used for the standard error was:

$$\frac{\hat{s}}{\sqrt{(1/n) + \bar{X}' (X'X)^{-1} \bar{X}}}$$

The denominator of this expression is the square root of the second row-second column element of matrix $(X'X)^{-1}$.

Applying this formula to the present example yields

$$\frac{0.34058}{\sqrt{0.087186}} = \frac{0.3406}{0.2953} = 1.153$$

and the coefficient of variation for the constant term (21.2, untransformed data) becomes, using the results from transformed data:

$$\frac{(100) \text{ STD Error constant}}{\text{constant term}} = \frac{100 (1.153)}{5.63} = 20.5\%$$

as given in Table 39 (Age Group-I).

For the coefficient of variation of the other parameter (slope), we have

$$\frac{(100) \text{ SE (BETA)}}{\text{BETA}} = \frac{(100) (0.01034)}{0.2385} = 4.3\%$$

as shown in Table 39 (Age Group-I).



Coefficients of variation were also estimated for the projections of the female working age "populations" in 1980. For age groups, we associated the two extreme population projections made by the Economic Council of Canada (1) to a four standard deviations range; in the case of the 25-44 age group, the E.C.C. made the following projections:

<u>Net Immigration Assumption</u> (annual)	<u>25-44 Female Population in 1980</u>
20,000	a) 3,144,000
70,000	b) 3,328,000
120,000	c) 3,514,000

The coefficient of variation was then estimated as

$$100 (c - a) / 4 (b)$$

that is $25 (c - a) / b$

and $25 (3,514,000 - 3,144,000) / 3,328,000$

or $25 (370,000) / 3,328,000 = 2.8\%$,

as shown in Table 39 (Age Group-I and Age Group-II).

For marital status groups and regions, the population coefficients of variation were all set at 2.7%, that is, 1.7% relative error for "all ages, 14 and over" (total), plus an assumed 1% relative error for our own simple extrapolations of past trends in the distributions of the populations concerned (see Table 18 for regions and Table 26 for marital status).

It is seen in this example that we have added the two relative errors associated with a result obtained from a product: total population by group percentage. We shall now present the various formulae which we have used to calculate coefficients of variation for results originating from products and sums of values being subject to estimation errors.

(1) Cf. Illing, Wolfgang M., et al., "Population, Family, Household and Labour Force Growth to 1980", Staff Study No. 19, Economic Council of Canada, Queen's Printer, Ottawa, Sept. 1967, 101 pages.

Let us define a few symbols:

W, X, Y : "input" variables;

Z : "output" variable;

V : X, Y or Z ; or $1/W$;

ΔV : absolute error in V equal to the standard error of V ;

$\Delta V/V$: relative error in V equal to the coefficient of variation (in decimals) of V ;

a : a constant with $\Delta a=0$, by definition.

The following (approximative) formulæ can be derived (and generalized) for each type of calculation yielding Z as an output value from inputs X and Y (and other inputs):

NO.	TYPE OF CALCULATION (Z)	COEFFICIENT OF VARIATION ($\Delta Z/Z$)
1	Product or Division (if $Y=1/W$) $Z = XY$ e.g.: Z = labour force, X = participation rate and Y = population.	$\frac{\Delta X}{X} + \frac{\Delta Y}{Y}$
2	Algebraic Sum ($X \neq Y$): $Z = X \pm Y$ e.g.: Z = GDP (Sum), X = goods and Y = services (production).	$\frac{\sqrt{(\Delta X)^2 + (\Delta Y)^2}}{X \pm Y}$
3	Algebraic Sum ($X \doteq Y$): $Z = X \pm Y$ e.g.: Z = unemployment (Difference), X = labour force and Y = employment.	$\frac{(X + Y)}{2(X \pm Y)} \sqrt{\left[\frac{\Delta X}{X}\right]^2 + \left[\frac{\Delta Y}{Y}\right]^2}$
4	Difference relatively to a Constant: $Z = \frac{X - a}{a}$ e.g.: Z = relative increase 1967-80, X = labour force in 1980 and a = labour force in 1967.	$\frac{X}{(X-a)} (\Delta X/X)$
5	Multiplication by a constant $Z = aX$ e.g.: Z = estimate of constant term for original model, X = constant with transformed data and $a = 1/(1-\text{Rho})$.	$\frac{\Delta X}{X}$

Formula No. 1 was used in Table 39 and Table 70, respectively, to compute the relative errors for the various female labour force and employment projections by group, for 1980. Formula No. 2 was used in Table 70 for "other occupations", "other sectors" and the "Prairies"; it was also used in Table 71 for "total production (GDP)" and the "male share of total employment". Table 72 made use of the first three formulae.

The fourth formula was used in Table 74 to obtain the coefficient of variation of a relative increase. For example, Table 33 indicates that the total female labour force will increase by 73.1% between 1967 and 1980, that is, from 2,365 to 4,095 thousands; Table 39 shows that the coefficient of variation for this 1980 total projection is 4.2%. Formula 4 permits us to state that the relative margin of error (68% confidence limits) about the projected 73.1% increase is

$$\frac{4,095 (4.2)}{4,095-2,365} \doteq 10\% \quad (\text{see Table 74}),$$

that is, $73.1\% \pm 0.10 (73.1\%)$ for a 65.8 to 80.4 confidence interval. Needless to say that we cannot conclude that there will be reduced female unemployment in 1980 even if Table 65 shows an expected increase of 74.4% for female employment in Canada, between 1967 and 1980. Formula 5 was used for the constant term.

In the case of an exponential equation, the standard error of the projected value was obtained through the following formula:

$$\pm \Delta Z = \text{antilog} (\log Z \pm \Delta \log Z) - Z$$

and the maximum value was retained. From there, the coefficient of variation ($\Delta Z/Z$) could be calculated. This formula was used in Table 71 for coefficients of variation of the "semi-logarithmic projections" obtained from (log) equations shown in Table 63. For the coefficient of variation of the constant term, a , (original model, untransformed data), the following formula was used, where c = estimate (in logarithms) of the intercept with transformed data:

$$\frac{\Delta a}{a} = \frac{\text{antilog} \left[\left(\frac{c}{1-\text{Rho}} \right) \left(1 + \frac{\Delta c}{c} \right) \right] - \text{antilog} \left(\frac{c}{1-\text{Rho}} \right)}{\text{antilog} \left(\frac{c}{1-\text{Rho}} \right)}$$

For example, for the production of goods we would have:

$$\begin{aligned} a &= \text{antilog} \left(\frac{c}{1-\text{Rho}} \right) = \text{antilog} \left(\frac{2.267}{1-0.428} \right) \\ &= \text{antilog} (3.963) \end{aligned}$$

that is, $a = 9,178$

as shown in Table 63;

from the computer output we have obtained

$$\frac{\Delta c}{c} = 0.012 \quad (\text{or } 1.2\%)$$

therefore,

$$\begin{aligned} \frac{\Delta a}{a} &= \frac{\text{antilog} [(3.963) (1.012)] - 9,183}{9,183} \\ &= 0.116, \text{ or } 11.6\%, \end{aligned}$$

as shown in Table 71. Therefore, we can say that there is a 68% chance that the "true" constant "a" lies somewhere in the following (68% confidence) interval:

$$9,178 \pm 11.6\%$$

that is, between 8,113 and 10,243.

TABLE 1

LABOUR FORCE*, CANADA

(estimates in thousands)

	<u>TOTAL</u>	<u>FEMALE</u>	<u>MALE</u>
1947	4942	1074	3869
48	4988	1066	3923
49	5055	1086	3969
50	5163	1112	4050
51	5223	1147	4076
52	5324	1180	4144
53	5397	1191	4206
54	5493	1231	4263
55	5610	1269	4341
56	5782	1346	4437
57	6008	1435	4573
58	6137	1496	4641
59	6242	1554	4687
60	6411	1657	4754
61	6521	1739	4782
62	6615	1797	4819
63	6748	1870	4879
64	6933	1972	4961
65	7141	2076	5065
66	7420	2227	5193
67	7694	2365	5329

* Labour Force is Population of 14 years and over either employed or actively seeking work (unemployed)

NOTE: data prior to 1950 do not include Newfoundland

SOURCE: Dominion Bureau of Statistics, Labour Force Surveys

TABLE 2

EMPLOYMENT IN ALL SECTORS OF THE ECONOMY, CANADA

(estimates in thousands)

	<u>TOTAL</u>	<u>FEMALE</u>	<u>MALE</u>
1947	4832	1056	3777
48	4875	1047	3828
49	4913	1066	3847
50	4976	1085	3891
51	5097	1123	3974
52	5169	1154	4015
53	5235	1172	4063
54	5243	1199	4044
55	5364	1236	4128
56	5585	1320	4266
57	5731	1402	4329
58	5706	1442	4263
59	5870	1507	4363
60	5965	1597	4368
61	6055	1674	4381
62	6225	1737	4488
63	6375	1808	4567
64	6609	1911	4698
65	6862	2020	4842
66	7152	2169	4983
67	7379	2296	5083

NOTE: data prior to 1950 do not include Newfoundland

SOURCE: Dominion Bureau of Statistics, Labour Force Surveys

TABLE 3

LABOUR FORCE PARTICIPATION RATES, BY SEX, CANADA

	MALES, <u>14 years and over</u>	FEMALES, <u>14 years and over</u>
1947	85.1%	24.1%
48	85.1	23.5
49	85.2	23.6
50	84.0	23.2
51	83.9	23.5
52	83.4	23.7
53	82.9	23.4
54	82.2	23.7
55	82.1	23.9
56	82.2	24.9
57	82.3	25.8
58	81.7	26.2
59	81.0	26.7
60	80.7	27.9
61	79.8	28.7
62	79.1	29.0
63	78.5	29.6
64	78.1	30.5
65	77.9	31.3
66	77.8	32.8
67	77.5	33.8

SOURCE: Dominion Bureau of Statistics, Labour Force Surveys

TABLE 4

SHARE OF TOTAL LABOUR FORCE AND EMPLOYMENT
REPRESENTED BY WOMEN WORKERS, CANADA

	Female labour force as a percent of the total labour force	Female employment as a percent of total employment
1947	21.7%	21.8%
48	21.4	21.5
49	21.5	21.7
50	21.5	21.8
51	21.9	22.0
52	22.1	22.3
53	22.0	22.4
54	22.4	22.8
55	22.6	23.0
56	23.3	23.6
57	23.9	24.4
58	24.4	25.3
59	24.9	25.7
60	25.8	26.8
61	26.6	27.6
62	27.1	27.9
63	27.7	28.3
64	28.4	28.9
65	29.1	29.4
66	30.0	30.3
67	30.1	31.1

SOURCE: Dominion Bureau of Statistics, Labour Force Surveys

TABLE 5

ANNUAL RATE OF CHANGE OF EMPLOYMENT IN ALL
SECTORS OF THE ECONOMY, CANADA

	<u>TOTAL</u>	<u>FEMALE</u>	<u>MALE</u>
1947	3.5%	0.0%	4.6%
48	0.9	-0.8	1.3
49	0.8	1.8	0.5
50	1.3	1.8	1.1
51	2.4	3.5	2.1
52	1.4	2.7	1.0
53	1.3	1.5	1.2
54	0.2	2.3	-0.5
55	2.3	3.1	2.1
56	4.1	6.8	3.3
57	2.6	6.2	1.5
58	-0.4	2.8	-1.5
59	2.9	4.5	2.3
60	1.6	6.0	0.1
61	1.5	4.8	0.3
62	2.8	3.8	2.4
63	2.4	4.1	1.8
64	3.7	5.7	2.8
65	3.8	5.7	3.1
66	4.2	7.4	2.9
67	3.2	5.8	2.0

SOURCE: Dominion Bureau of Statistics, Special Surveys Division

TABLE 6

ANNUAL RATE OF CHANGE OF EMPLOYMENT IN ALL
SECTORS OF THE ECONOMY, UNITED STATES

	<u>TOTAL</u>	<u>FEMALE</u>	<u>MALE</u>
1948	2.5%	3.3%	2.2%
49	-1.4	0.1	-2.0
50	2.0	3.7	1.3
51	2.0	5.3	0.6
52	0.2	1.2	-0.2
53	1.3	2.3	0.8
54	-1.0	-1.9	-0.6
55	3.0	5.7	1.8
56	3.0	4.8	2.2
57	0.1	1.1	-0.3
58	-1.6	-0.4	-2.2
59	2.5	2.7	2.4
60	1.7	3.3	0.9
61	0.2	1.3	-0.4
62	1.6	2.1	1.3
63	1.4	2.3	1.0
64	2.2	3.1	1.8
65	2.6	3.8	1.9
66	2.6	5.1	1.3

SOURCE: U.S. Department of Labor, Bureau of Labor Statistics

TABLE 7

ANNUAL RATES OF CHANGE OF GROSS NATIONAL PRODUCT,
MALE EMPLOYMENT AND FEMALE EMPLOYMENT, CANADA

	<u>Change in Female</u> <u>Employment</u>	<u>Change in Gross</u> <u>National Product*</u>	<u>Change in Male</u> <u>Employment</u>
1947	0.0%	1.3%	4.6%
48	-0.8	1.8	1.3
49	1.8	3.8	0.5
50	1.8	6.9	1.1
51	3.5	6.1	2.1
52	2.7	8.1	1.0
53	1.5	3.8	1.2
54	2.3	-3.0	-0.5
55	3.1	8.6	2.1
56	6.8	8.6	3.3
57	6.2	1.3	1.5
58	2.8	1.2	-1.5
59	4.5	3.4	2.3
60	6.0	2.4	0.1
61	4.8	2.4	0.3
62	3.8	6.8	2.4
63	4.1	5.1	1.8
64	5.7	6.4	2.8
65	5.7	6.7	3.1
66	7.4	6.0	2.9

* G.N.P. in constant (1957) dollars

SOURCE: Dominion Bureau of Statistics, Labour Force Surveys;
National Accounts, income and expenditures, 13-001

TABLE 8

UNEMPLOYMENT RATES, CANADA

	<u>TOTAL</u>	<u>FEMALES</u>	<u>MALES</u>
1947	2.2%	1.7%	2.3%
48	2.3	1.8	2.4
49	2.8	1.8	3.1
50	3.6	2.4	3.9
51	2.4	2.1	2.5
52	2.9	2.2	3.1
53	3.0	1.6	3.3
54	4.6	2.6	5.1
55	4.4	2.6	4.9
56	3.4	1.9	3.8
57	4.6	2.3	5.3
58	7.0	3.6	8.1
59	6.0	3.0	6.9
60	7.0	3.6	8.1
61	7.1	3.7	8.4
62	5.9	3.3	6.8
63	5.5	3.3	6.4
64	4.7	3.1	5.3
65	3.9	2.7	4.4
66	3.6	2.6	4.0
67	4.1	2.9	4.6

SOURCE: Dominion Bureau of Statistics, Special Surveys Division

TABLE 9

UNEMPLOYMENT RATES, UNITED STATES

	<u>TOTAL</u>	<u>FEMALES</u>	<u>MALES</u>
1947	3.9%	3.7%	4.0%
48	3.8	4.1	3.6
49	5.9	6.0	5.9
50	5.3	5.7	5.1
51	3.3	4.4	2.8
52	3.0	3.6	2.8
53	2.9	3.3	2.8
54	5.5	6.0	5.3
55	4.4	4.9	4.2
56	4.1	4.8	3.8
57	4.3	4.7	4.1
58	6.8	6.8	6.8
59	5.5	5.9	5.3
60	5.5	5.9	5.4
61	6.7	7.2	6.4
62	5.5	6.2	5.2
63	5.7	6.5	5.2
64	5.2	6.2	4.6
65	4.5	5.5	4.0
66	3.8	4.8	3.2

SOURCE: U.S. Department of Labor, Bureau of Labor Statistics

TABLE 10

TOTAL FEMALE LABOUR FORCE PARTICIPATION RATE AND THE RATE OF
GROWTH OF FEMALE EMPLOYMENT IN CANADA AND THE UNITED STATES

	<u>Canada</u>		<u>United States</u>	
	<u>Participation rate</u>	<u>Employment Growth rate</u>	<u>Participation rate</u>	<u>Employment Growth rate</u>
1948	23.5%	-0.8%	32.6%	3.3%
49	23.6	1.8	33.1	0.1
50	23.2	1.8	33.9	3.7
51	23.5	3.5	34.6	5.3
52	23.7	2.7	34.7	1.2
53	23.4	1.5	34.4	2.3
54	23.7	2.3	34.5	-1.9
55	23.9	3.1	35.7	5.7
56	24.9	6.8	36.8	4.8
57	25.8	6.2	36.8	1.1
58	26.2	2.8	37.0	-0.4
59	26.7	4.5	37.1	2.7
60	27.9	6.0	37.7	3.3
61	28.7	4.8	38.1	1.3
62	29.0	3.8	37.9	2.1
63	29.6	4.1	38.3	2.3
64	30.5	5.7	38.7	3.1
65	31.3	5.7	39.2	3.8
66	32.8	7.4	40.2	5.1
67	33.8	5.8	n.a	n.a

SOURCE: Dominion Bureau of Statistics; Table 3 and Table 5 above
U.S. Department of Labor, Bureau of Labour Statistics

TABLE 11

COMPOUNDED ANNUAL RATES OF GROWTH OF TOTAL FEMALE
PARTICIPATION RATE AND EMPLOYMENT

	<u>CANADA</u>		<u>UNITED STATES</u>	
	<u>Participation Rate</u>	<u>Employment</u>	<u>Participation Rate</u>	<u>Employment</u>
1948-57	0.9	2.9	1.3	2.5
1957-67	2.7	5.8		
1957-66			1.0	2.4

Source: Dominion Bureau of Statistics
Bureau of Labor Statistics, U.S. Department of Labor

TABLE 12-A

FEMALE WORKERS AS A PERCENT OF ALL WORKERS IN
EACH OF THE MAIN SECTORS OF THE CANADIAN ECONOMY, 1967

All sectors	31.1%
Agriculture	12.9
Non-agricultural goods-producing sectors	17.1
Forestry	1.2
Fishing and trapping	0.0
Mines, quarries and oil wells	5.2
Manufacturing	22.4
Construction	3.8
Service-producing sectors	41.3
Transportation, communications and utilities	14.5
Wholesale and retail trade	33.2
Finance, insurance and real estate	47.4
Community, business, personal and recreational services	60.5
Public administration	26.2

NOTE: The above-mentioned sectors are those of the 1960 Standard Industrial Classification.

SOURCE: Dominion Bureau of Statistics, Special Surveys Division.

TABLE 12-B

COMPOUNDED ANNUAL RATES OF GROWTH OF PRODUCTION AND
PRODUCTIVITY IN THE PRIVATE NON-AGRICULTURAL ECONOMY, 1946-66

	<u>PRODUCTION</u>	<u>PRODUCTIVITY*</u>
Goods-producing sectors	5.9% p.a.	4.0% p.a.
Service -producing sectors	4.9% p.a.	1.8% p.a.

* Production per man-hour

NOTE: The private non-agricultural economy is the total economy less agriculture, public administration and community services.

SOURCE: Dominion Bureau of Statistics, Special Surveys Division

TABLE 13

PERCENTAGE OF ALL FEMALE WORKERS IN EACH
SECTOR OF THE ECONOMY, 1967

Total female workers	100.0%
Agriculture	3.1
Non agricultural goods- producing sectors	18.4
Manufacturing	17.1
Construction	0.8
Others	0.5
Service-producing sectors	78.5
Transportation, communications and utilities	4.2
Wholesale and retail trade	17.7
Finance, insurance and real estate	6.4
Community, business, personal and recreational services	45.6
Public administration	4.6

SOURCE: Dominion Bureau of Statistics, Special Surveys Division

TABLE 15

FEMALE LABOUR FORCE PARTICIPATION RATES, BY AGE GROUP, CANADA

	<u>TOTAL</u>	<u>14-19 years</u>	<u>20-24</u>	<u>25-34</u>	<u>35-44</u>	<u>45-54</u>	<u>55-64</u>	<u>65 and over</u>
1950	23.2%	33.0%	46.4%	24.0%	20.5%	18.9%	13.2%	4.2%
51	23.5	34.2	46.9	24.0	21.3	20.3	12.7	4.1
52	23.7	33.1	47.1	24.1	22.5	20.6	13.4	3.9
53	23.4	33.2	47.2	23.9	22.1	20.5	12.9	3.6
54	23.7	33.6	46.6	24.4	22.1	21.1	14.0	3.7
55	23.9	32.9	46.3	24.2	23.2	22.2	14.7	3.9
56	24.9	33.3	47.1	25.1	23.8	24.4	15.8	4.5
57	25.8	33.1	46.5	26.2	25.2	26.3	18.2	5.0
58	26.2	32.1	47.4	26.3	26.2	27.5	19.2	5.2
59	26.7	32.1	46.5	26.5	27.5	28.6	20.1	5.2
60	27.9	32.6	47.9	27.3	29.3	30.4	21.3	5.6
61	28.7	32.3	48.7	28.2	30.2	32.1	23.2	5.9
62	29.0	30.9	49.7	28.5	31.1	33.3	23.8	5.6
63	29.6	29.9	50.3	29.4	31.6	34.6	24.6	5.9

.....cont'd

TABLE 14-A

FEMALE WORKERS AS A PERCENT OF ALL WORKERS IN EACH OF
THE MAIN OCCUPATION GROUPS, 1967

Managerial work	12.3%
Professional and technical workers	43.1
Office workers (clerical)	67.8
Store workers (selling)	38.3
Service workers	43.4
Production workers	13.1
Farm workers	12.0

TABLE 14-B

PERCENTAGE OF ALL FEMALE WORKERS IN EACH OF THE
MAIN OCCUPATION GROUPS, 1967

All female workers	100.0%
Managerial work	3.7
Professional and technical workers	17.2
Office workers (clerical)	30.6
Store workers (selling)	8.3
Service workers	24.3
Production workers	12.7
Farm workers	2.9

NOTE: Office workers are all those who perform clerical duties in an office, whether the office is in a factory, a store, a hospital,...etc. Service workers refer to those who work in the service-producing sectors but are neither office, managerial nor professional and technical workers.

SOURCE: Dominion Bureau of Statistics, Special Surveys Division.

TABLE 15 (continued)

	<u>TOTAL</u>	<u>14-19 years</u>	<u>20-24</u>	<u>25-34</u>	<u>35-44</u>	<u>45-54</u>	<u>55-64</u>	<u>65 and over</u>
1964	30.5	29.9	51.0	30.6	32.8	35.8	25.6	6.3
65	31.3	30.2	52.6	31.1	34.1	37.0	27.0	6.0
66	32.8	31.4	55.6	32.8	35.7	37.8	28.4	5.9
67	33.8	31.6	56.6	34.4	37.0	39.7	28.6	5.9

SOURCE: Dominion Bureau of Statistics, Special Surveys Division.

TABLE 16

IMMIGRATION, ESTIMATED EMIGRATION AND NET IMMIGRATION
(in thousands)

<u>Year ending</u> <u>May 31</u>	<u>Immigrants</u>	<u>Estimated</u> <u>Emigrants</u>	<u>Net Immigration</u>
1947	60.4	44.0	16.5
48	90.5	45.0	45.6
49	125.0	45.0	80.0
50	84.0	42.0	42.0
51	103.9	46.0	58.0
52	216.1	55.4	160.7
53	142.4	58.2	84.2
54	176.8	57.7	119.2
55	131.7	57.7	74.1
56	116.0	67.1	48.9
57	254.7	68.9	185.8
58	193.8	70.6	123.3
59	115.6	61.5	54.2
60	106.1	73.3	32.8
61	89.3	73.6	15.7
62	70.0	73.9	-3.9
63	79.0	76.8	2.2
64	102.3	77.1	25.3
65	121.1	81.2	40.0
66	166.0	68.8	97.2
67	214.2	51.8	162.5

SOURCE: Dominion Bureau of Statistics, Census Division

TABLE 17

PROJECTED FEMALE POPULATION AGED 14 YEARS AND OVER, BY AGE GROUP,
FOR 1980, UNDER THREE NET IMMIGRATION ASSUMPTIONS

(in Thousands)

	<u>Net immigration of 20 Thousands</u>	<u>Net immigration of 70 Thousands</u>	<u>Net immigration of 120 Thousands</u>
TOTAL	8864	9182	9501
14-19 years	1286	1317	1349
20-24 years	1076	1111	1146
25-44 years	3144	3328	3514
45-64 years	2260	2311	2362
65 and over	1098	1115	1130

SOURCE: Estimates made by the Economic Council of Canada, Staff Study No. 19

TABLE 18

FEMALE POPULATION 14 YEARS AND OVER IN EACH REGION AS A PERCENT
OF THE TOTAL CANADIAN FEMALE POPULATION 14 YEARS AND OVER

	<u>ATLANTIC</u>	<u>QUEBEC</u>	<u>ONTARIO</u>	<u>PRAIRIES</u>	<u>BRITISH COLUMBIA</u>
1950	11.0%	28.2%	34.7%	17.5%	8.5%
51	10.8	28.3	34.8	17.5	8.5
52	10.7	28.3	34.9	17.4	8.5
53	10.6	28.3	35.0	17.4	8.5
54	10.5	28.3	35.1	17.4	8.6
55	10.4	28.4	35.2	17.2	8.7
56	10.3	28.4	35.2	17.1	8.8
57	10.1	28.4	35.4	16.8	9.1
58	10.0	28.5	35.5	16.7	9.2
59	9.9	28.6	35.5	16.7	9.1
60	9.9	28.7	35.5	16.8	9.1
61	9.8	28.8	35.4	16.7	9.1
62	9.9	28.9	35.3	16.7	9.1
63	9.8	29.0	35.2	16.7	9.1
64	9.8	29.1	35.2	16.6	9.2
65	9.6	29.1	35.3	16.5	9.4
66	9.5	29.1	35.5	16.3	9.6
67	9.4	29.0	35.7	16.0	9.8
Projected					
1970	9.1	29.2	35.8	15.7	10.2
1975	8.7	29.5	36.1	15.1	10.6
1980	8.3	29.7	36.3	14.6	11.1

Note - Percentages for each year do not necessarily add up to 100% because of rounding in D.B.S. estimates and in our own calculations.

Source: Dominion Bureau of Statistics, Special Surveys Division

TABLE 19

PROJECTED FEMALE POPULATION 14 YEARS AND OVER, BY REGION, FOR 1980

UNDER THREE NET IMMIGRATION ASSUMPTIONS

(in Thousands)

	Net immigration of 20 thousands*	Net immigration of 70 thousands*	Net immigration of 120 thousands*
Atlantic	736	762	788
Quebec	2632	2727	2822
Ontario	3217	3333	3449
Prairies	1294	1340	1387
British Columbia	983	1019	1054
Canada	8864	9182	9501

* into Canada

Note - Because of rounding, populations for the regions do not necessarily add up to that for Canada.

TABLE 20

REGRESSION EQUATIONS: FEMALE LABOUR FORCE PARTICIPATION RATES IN CANADA (%) BY MARITAL STATUS, REGION AND AGE GROUP

GROUP	TIME ORIGIN t=0	INDEPENDENT VARIABLE ESTIMATED PARAMETER						Correlation Coefficient				
		Constant term	AFE/FE (Canada)	Time (quarter)	MPR (Canada)	AMER/MPR (Canada)	Dummy 2nd quarter	SER	FR	ACC/CC	Multiple (R)	Residuals (Rho)
Marital Status	1958-IV											
Single		-149.1	0.232	0.180	2.459	0	0.954				0.968	0.434
Married		16.4	0.102	0.321	0	0	0.551				0.987	0.590
Others		27.0	0	0.049	0	0	-0.452				0.666	0.485
Region	1952		(region)	(year)	(region)	(region)						
Atlantic		16.3	0	0.709	0	0					0.973	0
Quebec		19.5	0	0.817	0	0					0.916	0.584
Ontario		25.1	0.139	0.661	0	0					0.991	0
Prairies		-111.6	0.081	1.524	1.571	-0.872					0.999	0
B.C.		18.6	0.113	0.957	0	0					0.978	0.559
Age Group	1953-I		-	(quarter)	(Canada)	(Canada)						
14-19		46.8		0.118	-	0		-0.278			0.751	0.390
20-24		64.3		0.128	0	-			-0.088		0.887	0.554
25-44		21.2		0.239	0	0					0.952	0.735
45-64		16.5		0.333	0	0					0.981	0.624
65 and over		4.1		0.040	0	0					0.558	0.740
Total	1953-I	-3.0	-	0.232	0.300	0				-0.062	0.951	0.782

TABLE 21

PROJECTION OF FEMALE LABOUR FORCE PARTICIPATION RATES IN CANADA FOR 1980 BY MARITAL STATUS, REGION AND AGE GROUP

GROUP	Popul. Dist. in 1980 (%)	1980 INDEPENDENT VARIABLE PROJECTED VALUE							1980 Female Labour Force participation rate (%)			
		CONSTANT	Δ FE/FE (%)	TIME (quarter)	MPR (%)	Δ MPR/MPR (%)	DUMMY 2nd quarter	SER (%)	FR (per 1000)	Δ CC/CC (%)	ORIGINAL	REVISED
<u>Marital Status</u>	100	(Canada)	(Canada)	(quarter)	(Canada)	(Canada)		-	-	-	(47.1)	(44.6)
Single	28.5	1.0	1.3	86.0	77.7	0	1.0				58.7	55.5
Married	60.3	1.0	1.3	86.0	77.7	0	1.0				44.6	42.2
Others	11.2	1.0	1.3	86.0	77.7	0	1.0				30.8	29.2
<u>Region</u>	100	(region)	(region)	(year)	(region)	(region)	-	-	-	-	(44.6)	(44.6)
Atlantic	8.3	1.0	4.6	28.0	69.3	0					36.2	36.2
Quebec	29.7	1.0	4.5	28.0	77.8	0					42.4	42.4
Ontario	36.3	1.0	4.7	28.0	79.5	0					44.3	44.3
Prairies	14.6	1.0	4.8	28.0	77.7	0					53.5	53.5
B.C.	11.1	1.0	5.7	28.0	77.7	0					46.0	46.0
<u>Age Group</u>	100	-	-	(quarter)	(Canada)	(Canada)	-			-	(44.1)	(44.6)
14-19	14.3	1.0		109.0	-	0		93.0	-		33.7	34.1
20-24	12.1	1.0		109.0	77.7	0		-	158.1		64.3	65.0
25-44	36.3	1.0		109.0	77.7	0		-	-		47.2	47.8
45-64	25.2	1.0		109.0	77.7	0		-	-		52.8	53.5
65 and over	12.1	1.0		109.0	77.7	0		-	-		8.4	8.5
<u>Total</u>		1.0	-	109.0	77.7	0	-	-	-	2.8	45.5	44.6
				(quarter)	(Canada)	(Canada)						

TABLE 23

FEMALE LABOUR FORCE PARTICIPATION RATES, BY AGE GROUP, CANADA

	<u>Total</u>	<u>14-19 Years</u>	<u>20-24</u>	<u>25-44</u>	<u>45-64</u>	<u>65 and over</u>
1950	23.2%	33.0%	46.4%	22.4%	16.2%	4.2%
51	23.5	34.2	46.9	22.8	17.0	4.1
52	23.7	33.1	47.1	23.4	17.5	3.9
53	23.4	33.2	47.2	23.1	17.2	3.6
54	23.7	33.6	46.6	23.3	18.1	3.7
55	23.9	32.9	46.3	23.8	19.0	3.9
56	24.9	33.3	47.1	24.5	20.8	4.5
57	25.8	33.1	46.5	25.7	22.9	5.0
58	26.2	32.1	47.4	26.2	24.1	5.2
59	26.7	32.1	46.5	27.0	25.1	5.2
60	27.9	32.6	47.9	28.3	26.7	5.6
61	28.7	32.3	48.7	29.2	28.5	5.9
62	29.0	30.9	49.7	29.8	29.4	5.6
63	29.6	29.9	50.3	30.5	30.5	5.9

.....cont'd

TABLE 23 (continued)

	<u>Total</u>	<u>14-19 Years</u>	<u>20-24</u>	<u>25-44</u>	<u>45-64</u>	<u>65 and over</u>
64	30.5	29.9	51.0	31.7	31.6	6.3
65	31.3	30.2	52.6	32.6	32.9	6.0
66	32.8	31.4	55.6	34.3	33.9	5.9
67	33.8	31.6	56.6	35.7	35.1	5.9

SOURCE: Dominion Bureau of Statistics, Special Surveys Division

TABLE 23-A

PERCENTAGE DISTRIBUTION OF THE FEMALE WORKING AGE POPULATION AND LABOUR FORCE, BY AGE GROUP

	<u>14-19 years</u>		<u>20-24 years</u>		<u>25-44 years</u>		<u>45-64 years</u>		<u>65 years and over</u>	
	<u>Pop.</u>	<u>L.F.</u>	<u>Pop.</u>	<u>L.F.</u>	<u>Pop.</u>	<u>L.F.</u>	<u>Pop.</u>	<u>L.F.</u>	<u>Pop.</u>	<u>L.F.</u>
1950	13.1%	18.6%	11.4%	22.9%	40.7%	39.3%	24.3%	17.2%	10.3%	1.8%
51	12.7	18.5	11.1	22.2	41.1	39.8	24.2	17.5	10.5	1.8
52	12.6	17.7	10.9	21.6	41.3	40.8	24.3	17.9	10.6	1.7
53	12.6	17.8	10.7	21.5	41.4	40.8	24.3	17.9	10.8	1.6
54	12.6	17.9	10.5	20.7	41.4	40.9	24.4	18.6	10.9	1.7
55	12.7	17.4	10.3	20.0	41.4	41.2	24.4	19.4	11.0	1.8
56	12.8	17.4	10.2	19.3	41.4	40.7	24.4	20.4	11.1	2.0
57	12.9	16.6	10.0	18.2	41.2	41.1	24.5	21.8	11.1	2.1
58	13.2	16.1	10.0	18.1	40.8	40.9	24.7	22.6	11.1	2.2
59	13.5	16.2	9.8	17.2	40.4	40.9	24.9	23.4	11.1	2.1
60	13.8	16.1	9.7	16.8	40.0	40.6	25.1	24.0	11.1	2.2
61	14.1	15.9	9.7	16.5	39.4	40.1	25.3	25.1	11.2	2.3

.....cont'd

TABLE 23-A (continued)

	<u>14-19 years</u>		<u>20-24 years</u>		<u>25-44 years</u>		<u>45-64 years</u>		<u>65 years and over</u>	
	<u>Pop.</u>	<u>L.F.</u>	<u>Pop.</u>	<u>L.F.</u>	<u>Pop.</u>	<u>L.F.</u>	<u>Pop.</u>	<u>L.F.</u>	<u>Pop.</u>	<u>L.F.</u>
1962	14.6	15.5	9.7	16.6	38.7	39.7	25.5	25.8	11.2	2.1
63	15.1	15.2	9.8	16.7	38.0	39.2	25.6	26.4	11.2	2.2
64	15.5	15.2	10.0	16.7	37.3	38.8	25.7	26.6	11.2	2.3
65	15.8	15.3	10.2	17.1	36.7	38.1	25.8	27.1	11.2	2.1
66	16.0	15.4	10.5	17.9	36.1	37.8	25.9	26.8	11.2	2.0
67	16.1	15.0	10.9	18.3	35.6	37.7	26.0	27.0	11.2	1.9

Abbreviations: Pop. = Population ; L.F. = Labour Force

Note: Detail may not add up to 100% because of rounding

Source: D.B.S., Special Surveys Division

FEMALE LABOUR FORCE PARTICIPATION RATES, BY AGE GROUP, UNITED STATES

	<u>Total</u>	<u>14-19 Years</u>	<u>20-24</u>	<u>25-44</u>	<u>45-64</u>	<u>65 and over</u>
1950	33.9%	31.4%	46.1%	36.4%	33.2%	9.7%
51	34.6	32.0	46.6	37.4	34.4	8.9
52	34.7	31.4	44.8	37.8	35.1	9.1
53	34.4	30.4	44.5	37.5	35.5	10.0
54	34.5	29.7	45.3	37.7	36.3	9.3
55	35.7	29.8	46.0	38.2	38.9	10.6
56	36.8	31.8	46.4	39.2	40.8	10.9
57	36.8	30.5	46.0	39.4	41.3	10.5
58	37.0	29.1	46.4	39.5	42.4	10.3
59	37.1	29.3	45.2	39.4	43.6	10.2
60	37.7	30.1	46.2	39.8	44.3	10.8
61	38.1	29.8	47.1	40.2	44.8	10.7
62	37.9	29.0	47.4	40.4	45.1	9.9
63	38.3	28.3	47.6	41.2	45.8	9.6

.....cont'd

TABLE 24 (continued)

	<u>Total</u>	<u>14-19 Years</u>	<u>20-24</u>	<u>25-44</u>	<u>45-64</u>	<u>65 and over</u>
64	38.7	28.2	49.5	41.3	46.5	10.1
65	39.2	29.1	50.0	42.5	46.6	10.0
66	40.2	32.0	51.5	43.5	47.4	9.6

SOURCE: U.S. Department of Labor, Manpower Report of the President, April 1967.

TABLE 25

FEMALE LABOUR FORCE PARTICIPATION RATES, BY MARITAL
STATUS, CANADA

	<u>SINGLE</u>	<u>MARRIED</u>	<u>OTHERS*</u>
1959	51.6%	18.0%	25.8%
60	52.4	19.2	27.4
61	51.4	20.8	27.4
62	50.5	21.6	26.9
63	49.1	22.6	27.7
64	48.3	24.1	27.9
65	48.7	25.2	27.6
66	49.7	26.8	28.0
67	49.6	28.3	28.9

* Widowed, divorced or separated

NOTE: Data prior to 1959 are unavailable

SOURCE: Dominion Bureau of Statistics, Special Surveys Division

TABLE 26

PERCENTAGE DISTRIBUTION OF THE FEMALE POPULATION
AGED 14 YEARS AND OVER BY MARITAL STATUS

	<u>SINGLE</u>	<u>MARRIED</u>	<u>OTHERS*</u>
1959	23.5%	65.8%	10.7%
60	23.7	65.5	10.8
61	23.8	65.5	10.7
62	24.0	65.3	10.7
63	24.2	65.0	10.8
64	24.5	64.7	10.8
65	25.0	64.3	10.7
66	25.6	63.7	10.7
67	25.5	63.6	10.9
Projected			
1970	26.3	62.7	11.0
1975	27.4	61.5	11.1
1980	28.5	60.3	11.2

* Separated, divorced or widowed

Source: D.B.S., Special Surveys Division

TABLE 26-A

PERCENTAGE DISTRIBUTION OF THE FEMALE LABOUR FORCE BY MARITAL STATUS

	<u>SINGLE</u>	<u>MARRIED</u>	<u>OTHERS*</u>
1959	45.3%	44.3%	10.3%
1960	44.4	45.0	10.5
1961	42.4	47.3	10.2
1962	41.7	48.4	9.9
1963	40.2	49.7	10.1
1964	38.9	51.2	9.9
1965	38.9	51.7	9.4
1966	38.7	52.1	9.2
1967	37.4	53.3	9.3

* Widowed, separated or divorced.

Note: Detail may not add to 100% because of rounding.

Source: D.B.S., Special Surveys Division

TABLE 27

FEMALE LABOUR FORCE PARTICIPATION RATES, BY MARITAL
STATUS, UNITED STATES

	<u>SINGLE</u>	<u>MARRIED</u>	<u>OTHERS*</u>
1947	51.2%	20.0%	37.4%
48	51.1	22.0	38.7
49	50.9	22.5	37.1
50	50.5	23.8	37.8
51	49.6	25.2	39.3
52	50.0	25.3	38.8
53	48.5	26.3	39.1
54	49.0	26.6	39.4
55	46.4	27.7	39.6
56	46.4	29.0	39.4
57	46.8	29.6	40.4
58	45.4	30.2	40.8
59	43.4	30.9	41.2
60	44.1	30.5	40.0
61	44.4	32.7	42.0
62	41.7	32.7	39.1
63	41.0	33.7	38.5
64	40.9	34.4	38.7
65	40.5	34.7	38.9
66	40.8	35.4	39.5

* Widowed, divorced or separated

SOURCE: U.S. Department of Labor, Manpower report of the President, April 1967

TABLE 28 (continued)

	<u>Canada</u>	<u>Atlantic</u>	<u>Quebec</u>	<u>Ontario</u>	<u>Prairies</u>	<u>British Columbia</u>
1961	28.7	23.7	26.5	31.9	29.5	27.0
1962	29.0	23.7	26.7	31.9	30.6	28.3
1963	29.6	22.9	27.8	32.5	30.2	29.9
1964	30.5	23.9	28.1	34.0	30.7	31.2
1965	31.3	26.0	29.4	34.1	32.0	31.7
1966	32.8	26.9	31.5	35.2	33.2	32.5
1967	33.8	27.8	32.5	36.3	33.7	34.5

Source: D.B.S., Special Surveys Division

TABLE 28

FEMALE LABOUR FORCE PARTICIPATION RATES, BY REGION

	<u>Canada</u>	<u>Atlantic</u>	<u>Quebec</u>	<u>Ontario</u>	<u>Prairies</u>	<u>British Columbia</u>
1950	23.2%	17.8%	23.6%	25.8%	20.9%	23.0%
1951	23.5	18.5	23.9	26.2	21.2	22.5
1952	23.7	17.7	24.1	26.1	21.7	23.9
1953	23.4	17.9	24.6	25.9	20.1	22.9
1954	23.7	17.9	24.1	27.1	19.7	22.8
1955	23.9	18.6	23.9	27.5	20.4	22.7
1956	24.9	19.0	22.9	29.4	22.6	24.3
1957	25.8	20.4	24.1	30.1	23.0	25.3
1958	26.2	19.9	25.6	29.1	25.5	25.4
1959	26.7	20.2	25.9	29.6	26.5	25.8
1960	27.9	21.3	26.5	31.4	27.6	26.2

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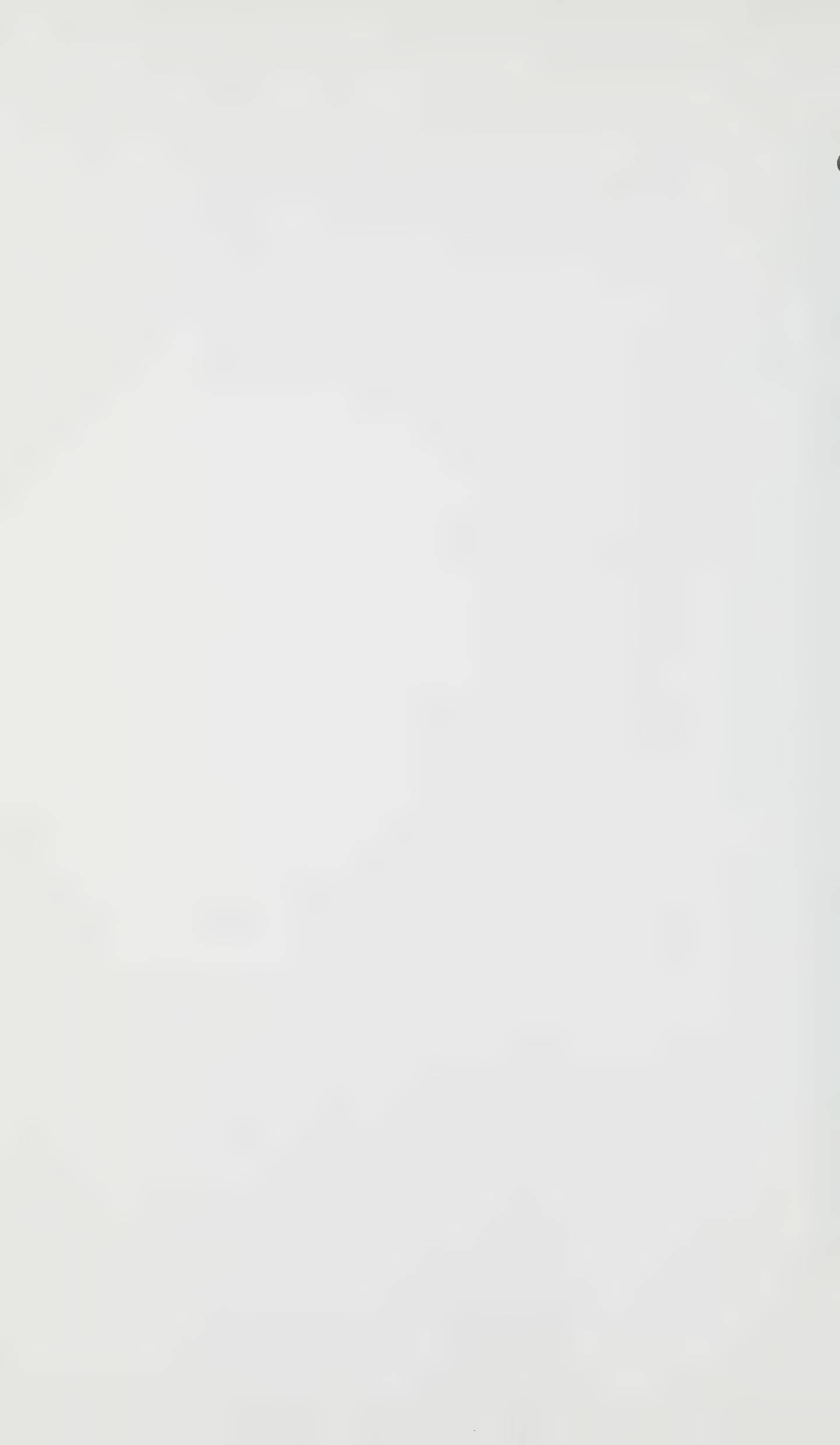


TABLE 28-A

PERCENTAGE DISTRIBUTION BY REGION OF THE TOTAL
CANADIAN FEMALE LABOUR FORCE

	<u>ATLANTIC</u>	<u>QUEBEC</u>	<u>ONTARIO</u>	<u>PRAIRIES</u>	<u>BRITISH COLUMBIA</u>
1950	8.5%	28.7%	38.7%	15.8%	8.5%
51	8.5	28.8	38.7	15.8	8.2
52	8.1	28.9	38.5	16.0	8.6
53	8.1	29.8	38.7	14.9	8.4
54	8.0	28.9	40.3	14.5	8.3
55	8.1	28.4	40.5	14.7	8.3
56	7.9	26.2	41.6	15.5	8.6
57	8.0	26.6	41.4	15.1	8.9
58	7.6	27.9	39.4	16.3	8.9
59	7.5	27.7	39.4	16.7	8.8
60	7.5	27.3	40.0	16.6	8.6
61	8.2	26.7	39.3	17.3	8.6
62	8.1	26.7	38.8	17.6	8.9
63	7.6	27.3	38.7	17.1	9.3
64	7.7	26.8	39.4	16.7	9.5
65	8.0	27.3	38.4	16.8	9.5
66	7.8	28.0	38.2	16.5	9.5
67	7.8	27.9	38.3	16.0	10.0

Note: Percentages for each year do not necessarily add up to 100% because of rounding in D.B.S. estimates and in our own calculations.

SOURCE: Dominion Bureau of Statistics, Special Surveys Division

TABLE 29

FEMALE POPULATION AGED 14 - 19 YEARSA - Percentage distribution of the population

	<u>14 years</u>	<u>15 and 16 years</u>	<u>17 - 19 years</u>
1962	19.0%	35.1%	45.9%
1963	18.9	35.2	45.9
1964	18.5	35.2	46.3
1965	18.1	34.9	47.0
1966	17.6	34.5	47.9
1967	17.5	34.1	48.4
Projected 1980	14.6	32.6	52.8

B - Participation rates

	<u>14 years</u>	<u>15 and 16 years</u>	<u>17-19 years</u>	<u>14-19 years</u>
1962	n.a.	16.4%	52.9%	30.9%
1963	5.5	15.1	51.5	29.9
1964	5.4	15.8	50.6	29.9
1965	5.3	16.0	50.3	30.2
1966	6.7	16.4	51.2	31.4
1967	6.6	16.4	51.2	31.6
Projected 1980*	---	---	---	33.3

*The projected 1980 rate of 33.3% for the 14-19 age group as a whole is obtained by applying the actual 1967 sub-group rates to the projected 1980 percentage distribution of the 14-19 age group population.

TABLE 30

FEMALE LABOUR FORCE IN 1980

Source population based on assumption of annual net immigration of 70,000

	<u>Working age population</u> <u>(in thousands)</u>	<u>Participation rate</u> <u>(%)</u>	<u>Labour Force</u> <u>(in thousands)</u>
a) Total, 14 years and over	9182	44.6%	4095
b) Marital status			(4088)
Single	2617	55.5	1452
Married	5537	42.2	2336
Others	1028	29.2	300
c) Region			(4094)
Atlantic	762	36.2	276
Quebec	2727	42.4	1156
Ontario	3333	44.3	1476
Prairies	1340	53.5	717
British Columbia	1019	46.0	469
d) Age Group			(4093)
14 - 19 years	1317	34.1	449
20 - 24 years	1111	65.0	722
25 - 44 years	3328	47.8	1591
45 - 64 years	2311	53.5	1236
65 years and over	1115	8.5	95

TABLE 30 (cont'd)

FEMALE LABOUR FORCE IN 1980Source population based on assumption of annual net immigration of 70,000

e) Age Sub-Group	<u>Working age population</u> (in thousands)	<u>Participation rate</u> (%)	<u>Labour Force</u> (in thousands)
25 - 34	1,975	46.8	924
35 - 44	1,353	51.4	695
45 - 54	1,222	58.8	719
55 - 64	1,089	45.1	491

TABLE 31

FEMALE LABOUR FORCE IN 1980

Source population based on assumption of annual net immigration of 120,000

	<u>Working age population</u> (in thousands)	<u>Participation rate</u> (%)	<u>Labour Force</u> (in thousands)
a) Total, 14 years and over	9501	44.6%	4234
b) Marital status			(4230)
Single	2708	55.5	1503
Married	5729	42.2	2417
Others	1064	29.2	310
c) Region			(4236)
Atlantic	788	36.2	285
Quebec	2822	42.4	1196
Ontario	3449	44.3	1528
Prairies	1387	53.5	742
British Columbia	1054	46.0	485
d) Age Group			(4243)
14 - 19	1349	34.1	460
20 - 24	1146	65.0	745
25 - 44	3514	47.8	1679
45 - 64	2362	53.5	1263
65 and over	1130	8.5	96

.....cont'd

TABLE 31 (cont'd)

FEMALE LABOUR FORCE IN 1980Source population based on assumption of annual net immigration of 120,000

	<u>Working age population</u> <u>(in thousands)</u>	<u>Participation rate</u> <u>(%)</u>	<u>Labour Force</u> <u>(in thousands)</u>
e) Age Sub-Group			
25 - 34	2,082	46.8	974
35 - 44	1,432	51.4	736
45 - 54	1,255	58.8	738
55 - 64	1,107	45.1	499

FEMALE LABOUR FORCE IN 1980

Source population based on assumption of annual net immigration of 20,000

	Working age population (in thousands)	Participation rate (%)	Labour Force (in thousands)
a) Total, 14 years and over	8864	44.6%	3953
b) Marital status			(3949)
Single	2526	55.5	1402
Married	5345	42.2	2255
Others	993	29.2	292
c) Region			(3951)
Atlantic	736	36.2	266
Quebec	2632	42.4	1116
Ontario	3217	44.3	1425
Prairies	1294	53.5	692
British Columbia	983	46.0	452
d) Age Group			(3947)
14 - 19	1286	34.1	438
20 - 24	1076	65.0	699
25 - 44	3144	47.8	1503
45 - 64	2260	53.5	1209
65 and over	1098	8.5	93

....cont'd

TABLE 32 (cont'd)

FEMALE LABOUR FORCE IN 1980

Source: population based on assumption of annual net immigration of 20,000

e) Age Sub-Group	<u>Working age population</u> (in thousands)	<u>Participation rate</u> (%)	<u>Labour Force</u> (in thousands)
25 - 34	1,869	46.8	875
35 - 44	1,275	51.4	655
45 - 54	1,189	58.8	699
55 - 64	1,071	45.1	483

PERCENTAGE INCREASE IN FEMALE LABOUR FORCE FROM 1967 to 1980

1980 labour force corresponds to assumption of annual net immigration of 70,000

	Actual 1967 (in thousands)	Projected 1980 (in thousands)	1967-80 increase (%)
a) Total, 14 years and over	2365	4095	73.1
b) Marital status			
Single	886	1452	63.8
Married	1260	2336	85.5
Others	220	300	36.5
c) Region			
Atlantic	184	276	50.1
Quebec	660	1156	75.3
Ontario	906	1476	62.9
Prairies	379	717	89.2
British Columbia	237	469	97.8
d) Age Group			
14 - 19	357	449	25.8
20 - 24	433	722	66.7
25 - 44	892	1591	78.4
45 - 64	639	1236	93.4
65 and over	46	95	105.4

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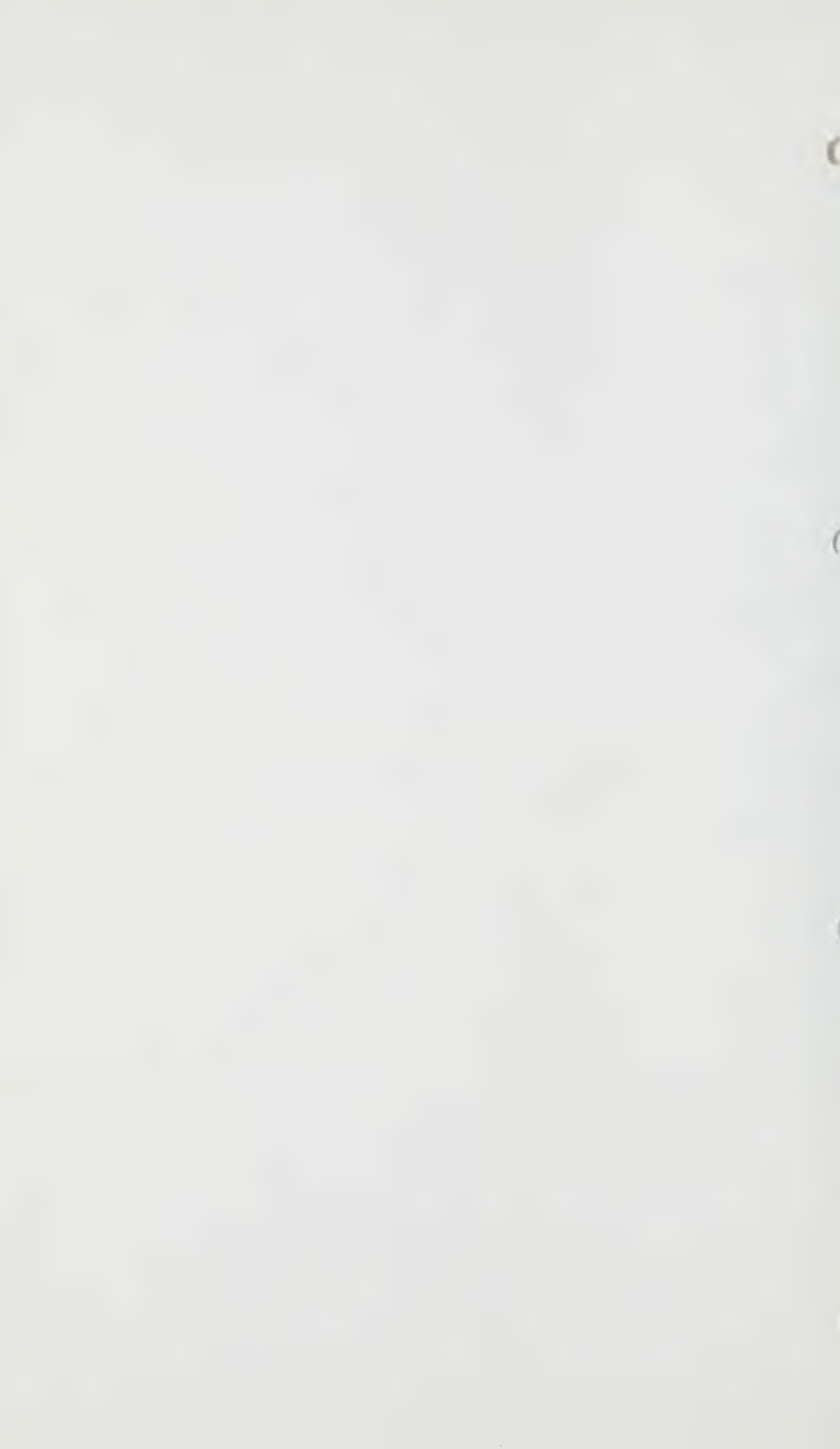


TABLE 33 (cont'd)

PERCENTAGE INCREASE IN FEMALE LABOUR FORCE FROM 1967 TO 1980

1980 labour force corresponds to assumption of annual net immigration of 70,000

e)	Age Sub-Group	Annual 1967 (in thousands)	Projected 1980 (in thousands)	1967-80 increase (%)
	25 - 34	424	924	118.0
	35 - 44	468	695	48.6
	45 - 54	422	719	70.3
	55 - 64	217	491	126.3

TABLE 34

SUMMARY: FEMALE LABOUR FORCE IN 1980 (BASED ON THREE IMMIGRATION ASSUMPTIONS): LEVEL, INCREASE AND DISTRIBUTION

GROUP	ANNUAL NET IMMIGRATION ASSUMPTION									
	Female Participation Rate (%)		20,000		120,000		70,000		1967 Female labour force (,000)	
	1967	1980	Working age population (,000)	Labour force (,000)	Working age population (,000)	Labour force (,000)	Working age population (,000)	Labour force (,000)	1967-1980 Female Labour force Increase (%) (70,000 net imm)	Female Labour Force Distribution (%)
TOTAL, 14 yrs. +	33.8	44.6	8,864	3,953	9,501	4,234	9,182	4,095	2,365	100.0
MARITAL STATUS				(3,949)		(4,230)		(4,088)	(2,366)	(72.8)
Single	49.6	55.5	2,526	1,402	2,708	1,503	2,617	1,452	886	37.4
Married	28.3	42.2	5,345	2,255	5,729	2,417	5,537	2,336	1,260	53.3
Others	28.9	29.2	993	292	1,064	310	1,028	300	220	9.3
REGION				(3,951)		(4,236)		(4,094)	(2,366)	(73.0)
Atlantic	27.8	36.2	736	266	788	285	762	276	184	7.8
Quebec	32.5	42.4	2,632	1,116	2,822	1,196	2,727	1,156	660	27.9
Ontario	36.3	44.3	3,217	1,425	3,449	1,528	3,333	1,476	906	38.3
Prairies	33.7	53.5	1,294	692	1,387	742	1,340	717	379	16.0
B.C.	34.5	46.0	983	452	1,054	485	1,019	469	237	10.0
AGE GROUP				(3,942)		(4,243)		(4,093)	(2,367)	(72.9)
14-19	31.6	34.1	1,286	438	1,349	460	1,317	449	357	15.1
20-24	56.6	65.0	1,076	699	1,146	745	1,111	722	433	18.3
25-44	35.7	47.8	3,144	1,503	3,514	1,679	3,328	1,591	892	37.7
45-64	35.1	53.5	2,260	1,209	2,362	1,263	2,311	1,236	639	27.0
65 and over	5.9	8.5	1,098	93	1,130	96	1,115	95	46	1.9
									105.4	2.3

...cont'd

TABLE 34 (cont'd)

SUMMARY : FEMALE LABOUR FORCE IN 1980 (BASED ON THREE IMMIGRATION ASSUMPTIONS) : LEVEL, INCREASE AND DISTRIBUTION

GROUP	ANNUAL NET IMMIGRATION ASSUMPTION												
	Female Participation Rate (%)		20,000				120,000		70,000		1967 Female labour force	1967-1980 Female Labour Force Increase (%)	Female Labour Force Distribution (%)
	1967	1980	Working age population	Labour force	Working age population	Labour force	Working age population	Labour force	Working age population	Labour force	(70,000 net imm)	1967 (70,000 net imm)	1980
			(,000)	(,000)	(,000)	(,000)	(,000)	(,000)	(,000)	(,000)	(,000)		
AGE SUB-GROUP													
25 - 34	34.4	46.8	1,869	875	2,082	974	1,975	924	424	117.9	17.9	22.6	
35 - 44	37.0	51.4	1,275	655	1,432	736	1,353	695	468	48.5	19.8	17.0	
45 - 54	39.7	58.8	1,189	699	1,255	738	1,222	719	422	70.4	17.8	17.6	
55 - 64	28.6	45.1	1,071	483	1,107	499	1,089	491	217	126.3	9.2	12.0	

Source: Table 30 to Table 33

ABSOLUTE AND RELATIVE INCREASES IN FEMALE LABOUR FORCE BETWEEN 1967 AND 1980 FOLLOWING POPULATION AND PARTICIPATION RATE INCREASES

G R O U P	Participation Rate (%)				Working Age Population (,000)		Labour Force 1967 (,000)	Labour Force Increases due to				Participation Rate Share (%)	
	1967	1980	80-67	1967	1980	80-67		Population		Participation Rate			
								Absolute (,000)	Relative (%)	Absolute (,000)	Relative (%)		
Operation	(2)-(1)				(5)-(4)		(7)	(1) x (6)	(8)/(7)	(5)x(3)	(10)/(7)	(9) + (11)	(11)/(12)
Column no	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Total: 14 yrs +	33.8	44.6	10.8	6,997	9,182	2,185	2,365	738.5	31.2	991.7	41.9	73.1	57.3
Marital Status													
Single	49.6	55.5	5.9	1,788	2,617	829	886	411.2	46.4	154.4	17.4	63.8	27.3
Married	28.3	42.2	13.9	4,449	5,537	1,088	1,260	307.9	24.4	769.6	61.1	85.5	71.5
Others	28.9	29.2	0.3	761	1,028	267	220	77.2	35.1	3.1	1.4	36.5	3.8
Region													
Atlantic	27.8	36.2	8.4	661	762	101	184	28.1	15.3	64.0	34.8	50.1	69.5
Quebec	32.5	42.4	9.9	2,029	2,727	698	660	226.9	34.4	270.0	40.9	75.3	54.3
Ontario	36.3	44.3	8.0	2,496	3,333	837	906	303.8	33.5	266.6	29.4	62.9	46.7
Prairies	33.7	53.5	19.8	1,124	1,340	216	379	72.8	19.2	265.3	70.0	89.2	78.5
B.C.	34.5	46.0	11.5	687	1,019	332	237	114.5	48.3	117.2	49.5	97.8	50.6
Age Group													
14 - 19	31.6	34.1	2.5	1,130	1,317	187	357	59.1	16.6	32.9	9.2	25.8	35.7
20 - 24	56.6	65.0	8.4	765	1,111	346	433	195.8	45.2	93.3	21.5	66.7	32.2
25 - 44	35.7	47.8	12.1	2,497	3,328	831	892	296.7	33.3	402.7	45.1	78.4	57.5
45 - 64	35.1	53.5	18.4	1,821	2,311	490	639	172.0	26.9	425.2	66.5	93.4	71.2
65 & Over	5.9	8.5	2.6	785	1,115	330	46	19.5	42.4	29.0	63.0	105.4	59.8
Age Sub-Group													
25 - 34	34.4	46.8	12.4	1,233	1,975	742	424	255.2	60.2	244.9	57.8	118.0	49.0
35 - 44	37.0	51.4	14.4	1,264	1,353	89	468	32.9	7.0	194.8	41.6	48.6	85.6
45 - 54	39.7	58.8	19.1	1,062	1,222	160	422	63.5	15.0	233.4	55.3	70.3	78.7
55 - 64	28.6	45.1	16.5	759	1,089	330	217	94.4	43.5	179.7	82.8	126.3	65.6

CONTRIBUTION OF POPULATION AND PARTICIPATION RATE INCREASES TO LABOUR FORCE INCREASE (1), 1967-80

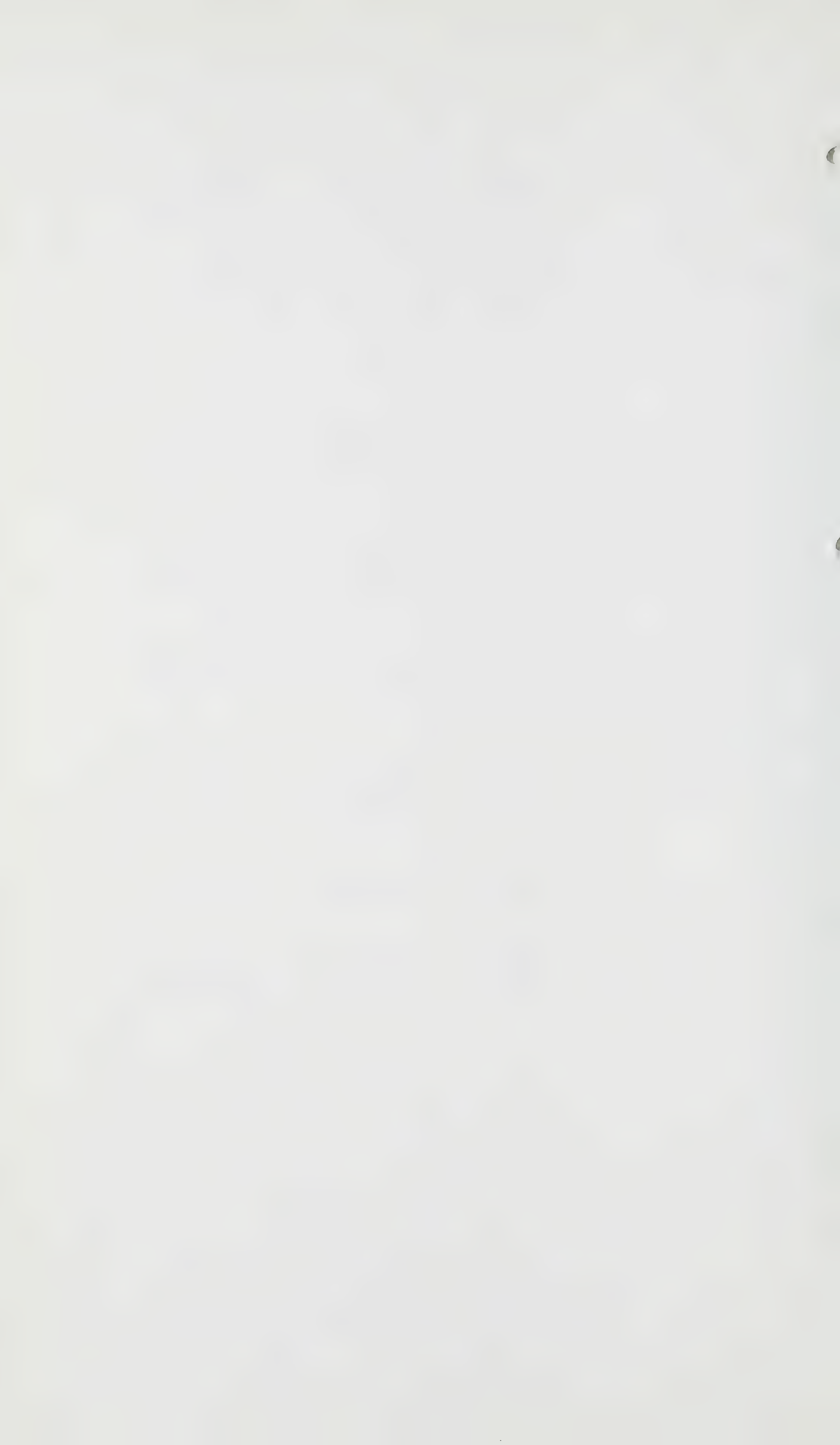
	Labour force increase (1)		Increase in labour force due to increase in: Population (2)		Participation rate (3)		Share of total increase in labour force due to participation rate increase (%)
	('000)	(%)	('000)	(%)	('000)	(%)	
Total, 14 and over	1730.2	73.1	738.5	31.2	991.7	41.9	57.3
Marital Status							
Single	565.6	63.8	411.2	46.4	154.4	17.4	27.3
Married	1077.5	85.5	307.9	24.4	769.6	61.1	71.5
Others	80.3	36.5	77.2	35.1	3.1	1.4	3.8
Region							
Atlantic	92.1	50.1	28.1	15.3	64.0	34.8	69.5
Quebec	496.9	75.3	226.9	34.4	270.0	40.9	54.3
Ontario	570.4	62.9	303.8	33.5	266.6	29.4	46.7
Prairies	338.1	89.2	72.8	19.2	265.3	70.0	78.5
British Columbia	231.7	97.8	114.5	48.3	117.2	49.5	50.6
Age Group							
14 - 19	92.0	25.8	59.1	16.6	32.9	9.2	35.7
20 - 24	289.1	66.7	195.8	45.2	93.3	21.5	32.2
25 - 44	699.4	78.4	296.7	33.3	402.7	45.1	57.5
45 - 64	597.2	93.4	172.0	26.9	425.2	66.5	71.2
65 and over	48.5	105.4	19.5	42.4	29.0	63.0	59.8

(1) Under the assumption of annual net immigration of 70,000

(2) Given the 1967 participation rate

(3) Given the 1980 population

...cont'd



CONTRIBUTION OF POPULATION AND PARTICIPATION RATE INCREASES TO LABOUR FORCE INCREASE, 1967-80

Age Sub-Group	Labour force increase (1) (,000)	Increase in labour force due to increase in:		Share of total increases in labour force due to partici- pation rate increase (%)
		Population (2) (,000)	Participation rate (3) (,000) (%)	
25 - 34	500.1	255.2	244.9	49.0
35 - 44	227.7	32.9	194.8	85.6
45 - 54	296.9	63.5	233.4	78.7
55 - 64	274.1	94.4	179.7	65.6

(1) Under the assumption of annual net immigration of 70,000

(2) Given the 1967 participation rate

(3) Given the 1980 population

TABLE 37

COMPARISON WITH ECONOMIC COUNCIL OF CANADA PROJECTIONS, FEMALE AND MALE PARTICIPATION RATES AND LABOUR FORCES FOR 1980

AGE GROUP	Participation Rates (in %)				Labour Forces * (in ,000)			
	Authors		E.C.C.		Authors		E.C.C.	
	Females	Females	Females	Males	Females	Females	Females	Males
Total, 14 years and over	44.6	40.1	77.7		4095	3681	7017	
14 - 19	34.1	31.1	36.7		449	409	502	
20 - 24	65.0	62.0	85.0		722	689	968	
25 - 44	47.8	43.4	97.5		1591	1446	3335	
45 - 64	53.5	45.7	91.3		1236	1057	2018	
65 and over	8.5	7.2	21.7		95	80	194	
AGE SUB-GROUP								
25 - 34	46.8	41.0	97.3		924	810	2003	
35 - 44	51.4	47.0	97.7		695	636	1332	
45 - 54	58.8	50.0	96.0		719	611	1170	
55 - 64	45.1	41.0	85.5		491	446	848	

* From a source population corresponding to an assumption of an annual net immigration of 70,000

Source: Economic Council of Canada, Staff Study No. 19, September 1967.

(2) Sub-totals may not add up to corresponding group estimates because the sub-group and group projections were made independently.
cont'd

TABLE 38 (cont'd)

PROJECTION OF FEMALE LABOUR FORCE IN 1970, 1975 and 1980
UNDER THE ASSUMPTION OF AN ANNUAL NET IMMIGRATION OF 70,000

LABOUR FORCE GROUP	Female Labour Force Participation Rate (%)				Female Working Age Population (1) (,000)				Female Labour Force (2) (,000)				Female Labour Force Distribution (%)			
	1967	1970	1975	1980	1967	1970	1975	1980	1967	1970	1975	1980	1967	1970	1975	1980
AGE SUB-GROUP																
25 - 34	34.4	36.5	41.5	46.8	1,233	1,311	1,636	1,975	424	479	679	924	17.9	17.8	20.2	22.6
35 - 44	37.0	39.6	45.3	51.4	1,264	1,236	1,227	1,353	468	489	556	695	19.8	18.2	16.5	17.0
45 - 54	39.7	43.8	51.2	58.8	1,062	1,142	1,232	1,222	422	500	631	719	17.8	18.6	18.8	17.6
55 - 64	28.6	32.7	38.8	45.1	759	840	961	1,089	217	275	373	491	9.2	10.2	11.1	12.0

(1) The Female Working Age Population in 1970, 1975 and 1980 was projected by the Economic Council of Canada for Total and Age Groups, and by the authors for Marital Status and Regions.

(2) Sub-totals may not add up to corresponding group estimates because the sub-group and group projections were made independently.

TABLE 39

COEFFICIENTS OF VARIATION OF ESTIMATED PARAMETERS AND OF 1980 PROJECTED FEMALE PARTICIPATION RATES AND LABOUR FORCES

G R O U P		Observa- tions	COEFFICIENTS OF VARIATION (% STANDARD ERROR OF VALUE OVER VALUE)									
			PARAMETERS (1)					Female Parti- icipation Rate in 1980				
			Δ FE	Time	MPR	Δ MPR	Dum. S.Q.	SER	FR	$\frac{\Delta CC}{CC}$	Female Working Age Population in 1980 (2)	Female Labour Force in 1980
Marital Status	(Quarter)		CST									
Single		35	2.1	44.4	30.6	18.5	--	25.6		4.4	2.7	7.1
Married		35	9.3	38.2	3.1	--	--	16.7		1.6	2.7	4.3
Others		35	10.5	--	36.7	--	--	44.0		4.2	2.7	6.9
Region (Year)												
Atlantic		15	8.9	--	6.6	--	--			2.7	2.7	5.4
Quebec		14	11.2	--	12.6	--	--			4.5	2.7	7.2
Ontario		15	2.7	29.5	4.1	--	--			1.2	2.7	3.9
Prairies		15	0.01	22.2	3.1	9.7	15.4			1.1	2.7	3.8
B.C.		14	7.2	36.3	6.8	--	--			2.7	2.7	5.4

(1) The symbol "--" indicates that the independent variable in question was not statistically significant; a blank space appears when the independent variable was not used in a particular regression equation.

(2) Our estimation.

TABLE 39 (continued 1)

COEFFICIENTS OF VARIATION OF ESTIMATED PARAMETERS AND OF 1980 PROJECTED FEMALE PARTICIPATION RATES AND LABOUR FORCES

COEFFICIENTS OF VARIATION (% STANDARD ERROR OF VALUE OVER VALUE)

G R O U P	Observations	PARAMETERS (1)										Female Parti- icipation Rate in 1980		Female Working Age Population in 1980 (2)	
		CST	$\frac{\Delta \text{GNP}}{\text{GNP}}$	Time	MPR	$\frac{\Delta \text{MPR}}{\text{MPR}}$	Dum. S.Q.	SER	FR	$\frac{\Delta \text{CC}}{\text{CC}}$					
Age Group-I (Quarter)															
14-19	57	0.7	--	44.0	--	--		27.7		5.9		1.2		7.1	
20-24	57	1.1	--	14.1	--	--			20.5	1.7		1.6		3.3	
25-44	57	2.1	--	4.3	--	--				2.1		2.8		4.9	
45-64	57	23.5	--	2.7	--	--				1.3		1.1		2.4	
65-+	57	81.9	--	20.0	--	--				7.4		0.7		8.1	
All Ages (Total)	57	3.2	--	7.8	50.7	--				2.5	45.2	1.7		4.2	
Age Group-II (3) (Quarter)		$\frac{\Delta \text{FE}}{\text{FE}}$													
14-19	57	1.3	46.3	--	17.7	--		--		1.3		1.2		2.5	
20-24	57	1.1	--	15.6	--	42.0				1.8		1.6		3.4	
25-44	57	24.4	21.8	5.4	--	--				2.0		2.8		4.8	
45-64	57	22.8	48.9	2.7	--	--				1.3		1.1		2.4	
65-+	57	0.3	--	24.6	54.3	--				8.5		0.7		9.2	
All Ages (Total)	57	3.1	13.6	6.8	33.3	--				2.4	32.7	1.7		4.1	

(3) Age Group-II regressions were not used to forecast the 1980 female labour force.

....cont'd

COEFFICIENTS OF VARIATION OF ESTIMATED PARAMETERS AND OF 1980 PROJECTED FEMALE PARTICIPATION RATES AND LABOUR FORCES

COEFFICIENTS OF VARIATION (% STANDARD ERROR OF VALUE OVER VALUE)

G R O U P	Observa- tions	PARAMETERS (1)					Female Parti- cipation Rate		Female Working Age Population in 1980 (2)
		$\frac{\Delta FE}{FE}$	Time	MPR	$\frac{\Delta MPR}{MPR}$	Dum. S.Q.	FR	$\frac{\Delta CC}{CC}$	
Age Sub-Group	(Year)	CST							
25-34	14	11.4	--	12.4	--	--		4.3	2.7
35-44	15	4.3	--	2.5	--	--		1.1	2.9
45-54	15	4.4	--	1.9	--	--		1.0	1.4
55-64	15	7.3	--	2.4	--	--		1.3	0.8
									2.1

(1) The symbol "--" indicates that the independent variable in question was not statistically significant; a blank space appears when the independent variable was not used in a particular regression equation.

(2) Our estimation.

(3) Age Group-II regressions were not used to forecast the 1980 female labour force.

Symbols of Variables					
CST	=	constant term	MPR	=	total male participation rate
$\frac{\Delta FE}{FE}$	=	percentage variation in total female employment	$\frac{\Delta MPR}{MPR}$	=	percentage variation in total male participation rate
$\frac{\Delta GNP}{GNP}$	=	percentage variation in Gross National Product	Dum. S.Q.	=	dummy variable, second quarter
			SER	=	school enrolment rate for the 14-19 age group
			FR	=	fertility rate for the 20-24 age group
			$\frac{\Delta CC}{CC}$	=	rate of change (%) of total consumer credit outstanding

TABLE 40

FEMALE EMPLOYMENT BY SECTOR OF THE ECONOMY
(in Thousands)

	<u>All Sectors</u>	<u>All Sectors less Agriculture</u>	<u>All Service- Producing Industries (1)</u>
1946	1,057	901	640
1947	1,056	911	654
1948	1,047	925	672
1949	1,066	963	691
1950	1,085	1,007	723
1951	1,123	1,051	765
1952	1,154	1,091	806
1953	1,172	1,130	831
1954	1,199	1,160	876
1955	1,236	1,201	904
1956	1,320	1,280	964
1957	1,400	1,361	1,036
1958	1,439	1,387	1,075
1959	1,502	1,464	1,127
1960	1,593	1,543	1,218
1961	1,674	1,615	1,270
1962	1,737	1,675	1,320
1963	1,808	1,740	1,366
1964	1,911	1,842	1,447
1965	2,020	1,948	1,554
1966	2,169	2,101	1,672
1967	2,296	2,224	1,783

(1) Includes Trade, Public administration and defence, Finance, Transportation and communications, and Community, recreational, business and personal services.

.....cont'd

TABLE 48

PERCENTAGE DISTRIBUTION OF FEMALE EMPLOYMENT BY REGION
 (% of total canadian female employment)

	<u>Atlantic</u>	<u>Quebec</u>	<u>Ontario</u>	<u>Prairies</u>	<u>British Columbia</u>
1953	8.2%	29.5%	38.9%	15.0%	8.3%
1954	8.0	28.7	40.4	14.6	8.3
1955	8.1	28.1	40.7	14.8	8.3
1956	7.9	26.0	41.9	15.6	8.5
1957	8.0	26.4	41.6	15.2	8.9
1958	7.6	27.6	39.6	16.6	8.7
1959	7.5	27.5	39.7	16.9	8.6
1960	7.6	27.0	40.3	16.8	8.5
1961	8.1	26.4	39.5	17.5	8.5
1962	7.9	26.5	38.9	17.8	8.8
1963	7.7	27.0	38.9	17.2	9.1
1964	7.7	26.7	39.5	16.8	9.2
1965	8.0	27.0	38.6	17.0	9.3
1966	7.8	27.8	38.3	16.6	9.4
1967	7.8	27.7	38.4	16.2	9.8

Note: Detail may not add up to 100% because of rounding

Source: D.B.S., Special Surveys Division

TABLE 47

PERCENTAGE DISTRIBUTION OF FEMALE EMPLOYMENT BY OCCUPATION

(% of total employment)								
	Professionals and Technicians	Saleswomen	Managers	Office Workers	Production Workers	Service Workers	Farm Workers	Other Occupations
1953	11.8%	10.2%	3.7%	29.4%	16.0%	23.1%	3.6%	2.1%
1954	12.3	10.4	3.5	29.9	14.6	24.0	3.3	2.0
1955	12.3	10.1	3.6	30.2	15.0	24.0	2.9	1.9
1956	12.3	9.8	3.3	31.0	14.8	23.8	3.0	1.9
1957	13.6	9.8	3.6	30.5	14.1	23.7	2.8	1.9
1958	13.4	9.5	3.8	31.0	12.8	24.2	3.5	1.9
1959	14.5	9.9	3.8	30.1	13.0	23.6	3.1	2.0
1960	15.3	9.6	3.8	29.9	12.3	24.0	3.1	1.9
1961	15.0	9.4	3.7	30.0	12.0	24.9	3.4	1.6
1962	15.8	9.3	3.7	29.9	12.1	24.0	3.5	1.7
1963	15.1	9.0	3.6	30.2	12.2	24.6	3.7	2.0
1964	15.4	9.1	3.8	29.3	12.1	25.2	3.5	1.7
1965	16.4	8.7	3.8	29.7	11.4	24.9	3.4	1.6
1966	17.5	8.3	3.6	30.6	11.4	24.0	3.0	1.6
1967	17.2	8.4	3.7	30.7	11.2	24.3	3.0	1.6

Note: Detail may not add up to 100% because of rounding.

Source: D.B.S., Special Surveys Division

TABLE 46 (continued 2)

PERCENTAGE DISTRIBUTION OF FEMALE EMPLOYMENT
BY SECTOR OF THE ECONOMY

(% of total employment)

	<u>Agriculture</u>	<u>Finance</u>	<u>Transportation and Communications</u>	<u>Other Sectors</u>
1953	3.6%	6.2%	4.6%	1.5%
1954	3.3	6.3	4.7	1.3
1955	2.8	6.4	4.5	1.4
1956	3.0	6.6	4.5	1.7
1957	2.8	6.7	4.6	1.6
1958	3.6	6.7	4.4	1.5
1959	2.5	6.6	4.3	1.7
1960	3.1	6.7	4.0	1.4
1961	3.5	6.5	3.6	2.2
1962	3.6	6.6	3.6	2.2
1963	3.8	6.6	3.7	2.3
1964	3.6	6.2	3.3	2.1
1965	3.6	6.3	3.3	2.2
1966	3.1	6.6	3.1	2.2
1967	3.1	6.4	3.2	2.0

Note: Detail may not add up to 100% because of rounding.

Source: D.B.S., Special Surveys Division

TABLE 46 (Continued 1)

PERCENTAGE DISTRIBUTION OF FEMALE EMPLOYMENT
BY SECTOR OF THE ECONOMY
(% of total employment)

	<u>Community, Recreational, Business and Personal Services</u>	<u>Wholesale and Retail Trade</u>	<u>Public Administration and Defence</u>
1953	34.4%	20.9%	4.6%
1954	35.9	20.9	4.9
1955	36.5	20.6	4.7
1956	36.4	20.3	4.8
1957	37.4	20.1	4.6
1958	38.4	19.9	4.8
1959	39.3	19.9	4.7
1960	41.1	19.6	4.8
1961	42.1	18.9	4.8
1962	42.3	18.8	4.7
1963	42.6	18.4	4.3
1964	43.4	18.4	4.4
1965	44.6	18.5	4.3
1966	45.1	17.8	4.4
1967	45.6	17.7	4.6

....cont'd

TABLE 46

PERCENTAGE DISTRIBUTION OF FEMALE EMPLOYMENT
BY SECTOR OF THE ECONOMY

(% of total employment)

	<u>All Sectors less Agriculture</u>	<u>All Service- Producing Industries</u>	<u>Manufacturing</u>
1953	96.4%	70.9%	24.1%
1954	96.7	73.1	22.4
1955	97.2	73.1	22.7
1956	97.0	73.0	22.3
1957	97.2	74.0	21.6
1958	96.4	74.7	20.2
1959	97.5	75.0	20.0
1960	96.9	76.5	19.0
1961	96.5	75.9	18.5
1962	96.4	76.0	18.2
1963	96.2	75.6	18.4
1964	96.4	75.7	18.6
1965	96.4	76.9	17.3
1966	96.9	77.1	17.7
1967	96.9	77.7	17.2

.....cont'd

TABLE 45

PERCENTAGE INCREASE IN THE NUMBER OF EMPLOYED WOMEN BY REGION
(increase in %)

	<u>1948-67</u>	<u>1948-57</u>	<u>1958-67</u>
Canada	119.4%	33.7%	59.5%
Atlantic	121.0	38.3	62.7
Quebec	124.7	30.7	60.2
Ontario	117.5	43.7	54.5
Prairies	97.3	12.6	56.0
British Columbia	151.1	38.9	79.3

Source: D.B.S., Special Surveys Division

TABLE 44

PERCENTAGE INCREASE IN THE NUMBER OF EMPLOYED WOMEN BY OCCUPATION
(increase in %)

	<u>1948-67</u>	<u>1948-57</u>	<u>1958-67</u>
All Occupations	119.4%	33.7%	59.5%
Managers	160.6	51.5	59.2
Professionals and Technicians	283.5	85.4	104.6
Saleswomen	66.9	19.1	40.1
Office Workers	151.4	52.5	57.8
Service Workers	169.5	60.4	60.3
Production Workers	54.8	18.7	39.7
Farm Workers	-43.8	-67.8	36.0
Other Occupations	63.6	22.7	33.3

Source: D.B.S., Special Surveys Division

TABLE 43

PERCENTAGE INCREASE IN THE NUMBER OF EMPLOYED WOMEN BY
SECTOR OF THE ECONOMY

(increase in %)

	<u>1948-67</u>	<u>1948-57</u>	<u>1958-67</u>
All Sectors	119.4%	33.7%	59.5%
All Sectors less Agriculture	140.4	47.1	60.3
Service-Producing Industries	165.3	54.1	65.8
Manufacturing	62.8	24.8	35.8
Community, Recreational, Business and Personal Services	233.7	66.5	89.5
Public Administration and Defence	92.7	18.2	53.6
Agriculture	-41.0	-68.1	38.4
Finance	150.8	59.3	54.1
Transportation and Communications	89.7	66.6	15.6
Wholesale and Retail Trade	100.5	38.9	42.3
Other Sectors*	327.3	109.1	113.6

* Mining and quarrying, Forestry, Public utilities and Construction.

Source: D.B.S., Special Surveys Division.

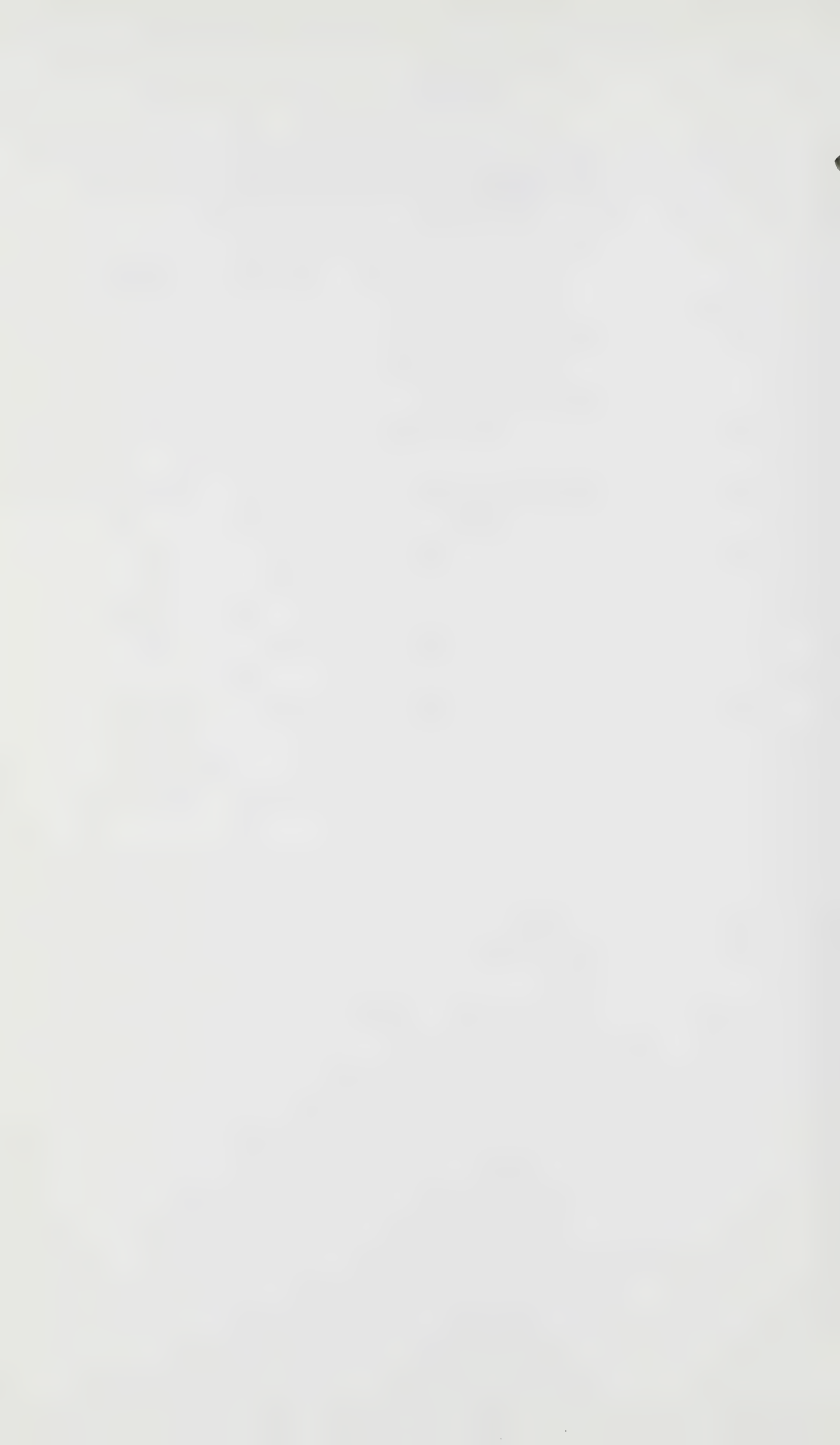


TABLE 42

FEMALE EMPLOYMENT BY REGION
(in Thousands)

	<u>Canada</u>	<u>Atlantic</u>	<u>Quebec</u>	<u>Ontario</u>	<u>Prairies</u>	<u>British Columbia</u>
1946	1057	76	271	408	218	84
1947	1056	79	274	413	200	92
1948	1047	81	283	405	189	90
1949	1066	80	303	420	170	93
1950	1085	91	308	422	172	92
1951	1123	96	322	436	177	92
1952	1154	92	329	447	186	100
1953	1172	96	346	456	176	98
1954	1199	96	344	485	175	100
1955	1236	100	347	503	183	103
1956	1320	104	343	553	206	113
1957	1400	112	370	582	213	125
1958	1439	110	397	570	239	126
1959	1502	113	414	596	255	130
1960	1593	122	430	642	268	135
1961	1674	136	442	662	293	142
1962	1737	138	461	676	309	153
1963	1808	139	489	704	312	164
1964	1911	147	510	756	322	177
1965	2020	161	546	780	343	189
1966	2169	169	604	830	361	204
1967	2296	179	636	881	373	226

Source: D.B.S., Special Surveys Division

TABLE 41 (continued)

FEMALE EMPLOYMENT BY OCCUPATION

	<u>All Occupations</u>	<u>Professionals and Technicians</u>	<u>Saleswomen</u>	<u>Managers</u>	<u>Office Workers</u>	<u>Production Workers</u>	<u>Service* Workers</u>	<u>Farm Workers</u>	<u>Other Occupations</u>
1962	1,737	274	161	65	520	211	417	60	29
1963	1,808	273	163	65	546	220	445	66	36
1964	1,911	294	173	72	560	231	481	67	33
1965	2,020	332	176	77	600	231	503	68	33
1966	2,169	380	180	79	664	248	520	64	34
1967	2,296	395	192	86	704	257	558	68	36

* Includes all women working in service-producing industries who are neither managers nor professionals and technicians nor saleswomen nor office workers.

Source: D.B.S., Special Surveys Division

TABLE 41

FEMALE EMPLOYMENT BY OCCUPATION
(in thousands)

	All Occupations	Professionals and Technicians	Saleswomen	Managers	Office Workers	Production Workers	Service Workers*	Farm Workers	Other Occupations
1948	1,047	103	115	33	280	166	207	121	22
1949	1,066	104	119	42	289	171	218	104	19
1950	1,085	108	113	49	300	183	239	78	18
1951	1,123	115	121	47	327	183	239	72	19
1952	1,154	117	126	45	333	182	266	64	21
1953	1,172	138	120	43	345	188	271	42	25
1954	1,199	147	125	42	359	175	288	39	24
1955	1,236	152	125	45	373	184	297	36	24
1956	1,320	162	130	44	409	196	314	40	25
1957	1,400	191	137	50	427	197	332	39	27
1958	1,439	193	137	54	446	184	348	50	27
1959	1,502	218	149	57	452	195	354	47	30
1960	1,593	244	153	61	476	196	383	49	31
1961	1,674	251	158	62	502	201	417	57	26

.....cont'd

TABLE 40 (continued 2)

FEMALE EMPLOYMENT BY SECTOR OF THE ECONOMY
(in thousands)

	<u>Public Administration and Defence</u>	<u>Agriculture</u>	(2) <u>Finance</u>	<u>Transportation and Communications</u>	Other (3) <u>Sectors</u>
1946	52	156	50	41	11
1947	51	145	54	40	12
1948	55	122	59	39	11
1949	54	103	62	45	10
1950	57	78	64	48	10
1951	57	72	68	53	13
1952	51	63	71	54	16
1953	54	42	73	54	17
1954	59	39	76	56	15
1955	58	35	79	56	17
1956	63	40	87	60	22
1957	65	39	94	65	23
1958	69	52	96	64	22
1959	70	48	99	64	26
1960	76	50	107	63	23
1961	80	59	109	60	36
1962	81	62	114	63	38
1963	78	68	119	66	41
1964	84	69	118	63	40
1965	86	72	128	67	44
1966	95	67	144	67	47
1967	106	72	148	74	47

(2) Also includes Insurance and Real estate.

(3) Includes Mining and quarrying, Forestry, Public utilities and Construction.

Source: Dominion Bureau of Statistics, Special Surveys Division.

TABLE 40 (continued 1)

FEMALE EMPLOYMENT BY SECTOR OF THE ECONOMY
(in Thousands)

	<u>Manufacturing</u>	<u>Community, Recreational Business and Personal Services</u>	<u>Wholesale and Retail Trade</u>
1946	250	298	196
1947	245	305	202
1948	242	314	203
1949	262	324	206
1950	274	343	208
1951	273	356	231
1952	269	379	248
1953	282	403	245
1954	269	430	250
1955	280	451	254
1956	294	480	268
1957	302	523	282
1958	290	553	286
1959	301	590	299
1960	302	654	313
1961	309	705	316
1962	317	735	327
1963	333	771	332
1964	355	830	352
1965	350	900	373
1966	383	979	387
1967	394	1,048	407

.....cont'd

TABLE 49

FEMALE EMPLOYMENT AS A PERCENT OF TOTAL EMPLOYMENT

	<u>Total Employment</u> (in ,000)	<u>Female Employment</u> (in ,000)	<u>Women as a % of total</u>
1946	4,666	1,057	22.6%
1947	4,832	1,056	21.8
1948	4,875	1,047	21.5
1949	4,913	1,066	21.7
1950	4,976	1,085	21.8
1951	5,097	1,123	22.0
1952	5,159	1,154	22.3
1953	5,235	1,172	22.4
1954	5,243	1,199	22.8
1955	5,364	1,236	23.0
1956	5,585	1,320	23.6
1957	5,725	1,400	24.4
1958	5,695	1,439	25.2
1959	5,856	1,502	25.6
1960	5,955	1,593	26.7
1961	6,055	1,674	27.6
1962	6,225	1,737	27.9
1963	6,375	1,808	28.3
1964	6,609	1,911	28.9
1965	6,862	2,020	29.4
1966	7,152	2,169	30.3
1967	7,379	2,296	31.1

Source: D.B.S., Special Surveys Division

TABLE 50

PERCENTAGE DISTRIBUTION OF FEMALE PRODUCTION WORKERS IN
MANUFACTURING INDUSTRIES, ANNUAL AVERAGE FOR 1961-64

<u>CANADA</u>	
<u>Name of industry</u>	<u>Percent of all female production workers in manufacturing</u>
Total manufacturing (221,267 women)	100.0%
(2431) Men's clothing	8.7
(2441) Women's clothing	8.2
(1740) Leather footwear	4.2
(3350) Electronic equipment	4.0
(2390) Knitted goods	4.0
(1120) Canned fruits and vegetables	2.9
(2860) Commercial printing	2.8
(2450) Children's clothing	2.7
(2442) Women's clothing contractors	2.1
(1830) Cotton yarn and cloth	2.1
(2310) Hosiery products	2.0
(1310) Candy products	2.0
(1290) Bakery products	1.8
(1110) Prepared fish products	1.8
(2432) Men's clothing contractors	1.8
(1530) Cigars, cigarettes and kindred products	1.7
(1011) Meat packing and slaughtering	1.6
(3390) Miscellaneous electrical products	1.6
(2480) Foundation garments	1.5
(1392) Miscellaneous food products	1.4
(1290) Biscuits	1.4
(2010) Synthetic textiles	1.3
(3250) Motor vehicle parts and accessories	1.3
(2299) Miscellaneous textile products	1.2
(3850) Plastic goods and parts	1.2
(2740) Miscellaneous paper products	1.1
(1799) Miscellaneous leather products	1.1
(2731) Folding and set-up paper boxes	1.0
Other industries	31.5

Source: D.B.S., Manufacturing Industries of Canada, 31-203

TABLE 51

FEMALE PRODUCTION WORKERS AS A PERCENT OF ALL PRODUCTION WORKERS IN
MANUFACTURING INDUSTRIES, WHERE THEY PREDOMINATE OVER MALES, ANNUAL
AVERAGE FOR 1961 - 64

CANADA

<u>Name of industry</u>	<u>Female production workers as a percent of all production workers</u>
Total manufacturing (772,447 production workers)	22.3%
(2442) Women's clothing contractors	90.7
(2480) Foundation garments	89.3
(2491) Fabric gloves	83.4
(2450) Children's clothing	82.2
(3997) Umbrellas and similar products	78.6
(2441) Women's clothing	78.5
(2432) Men's clothing contractors	75.3
(2499) Miscellaneous clothing	74.6
(2431) Men's clothing	70.8
(2390) Knitted goods	70.4
(3989) Pens and pencils	69.3
(2291) Automobile fabric accessories	66.8
(2299) Miscellaneous textile products	66.5
(2310) Hosiery products	66.0
(3770) Cosmetics and toilet preparations	64.8
(1930) Wool spinning	63.2
(2230) Cotton and jute bags	62.8
(1750) Leather gloves	61.9
(2470) Hats and caps	61.8
(3812) Clocks and watches	61.8
(2292) Embroideries, pleatings and hem-stitchings	60.8
(3932) Toys and games	60.4
(1280) Biscuits	59.6
(1799) Miscellaneous leather goods	58.4

....cont'd

TABLE 51 (cont'd)

FEMALE PRODUCTION WORKERS AS A PERCENT OF ALL PRODUCTION WORKERS IN
MANUFACTURING INDUSTRIES, WHERE THEY PREDOMINATE OVER MALES, ANNUAL
AVERAGE FOR 1961 - 64

CANADA

Female production workers as a
percent of all production workers

(2120) Thread	57.8%
(1530) Cigars, cigarettes and kindred products	57.5
(1310) Candy products	56.6
(3984) Artificial flowers and feathers	56.3
(3981) Buttons, buckles and fasteners	54.7
(2210) Canvas products	53.4
(1740) Leather footwear	51.2
(3813) Orthopaedic and surgical appliances	50.8

Source: D.B.S., Manufacturing Industries of Canada, 31-203

TABLE 52

PERCENTAGE DISTRIBUTION OF FEMALE PRODUCTION WORKERS IN
MANUFACTURING INDUSTRIES, ANNUAL AVERAGE FOR 1961-64

QUEBEC

<u>Name of industry</u>	<u>Percent of all female production workers in manufacturing</u>
Total manufacturing (92,933 women)	100.0%
(2441) Women's clothing	13.1
(2431) Men's clothing	9.8
(1740) Leather footwear	5.2
(2450) Children's clothing	4.7
(2442) Women's clothing contractors	4.5
(2390) Knitted goods	4.0
(2432) Men's clothing contractors	3.9
(1530) Cigars, cigarettes and kindred products	3.4
(2310) Hosiery products	3.1
(1830) Cotton yarn and cloth	2.9
(3350) Electronic equipment	2.5
(2480) Foundation garments	2.4
(2010) Synthetic textiles	2.1
(2860) Commercial printing	1.8
(2299) Miscellaneous textiles products	1.6
(3390) Miscellaneous electrical products	1.4
(1280) Biscuits	1.4
(1290) Bakery products	1.3
(1799) Miscellaneous leather goods	1.3
(1310) Candy products	1.2
(2470) Hats and caps	1.2
(1392) Miscellaneous food products	1.1
(1120) Canned fruits and vegetables	1.0
Other industries	25.1

Source: D.B.S., Manufacturing Industries of Canada, 31-205

TABLE 53

FEMALE PRODUCTION WORKERS AS A PERCENT OF ALL PRODUCTION WORKERS IN
MANUFACTURING INDUSTRIES WHERE THEY PREDOMINATE OVER MALES,
ANNUAL AVERAGE FOR 1961-64

<u>Name of industry</u>	<u>Quebec</u> <u>Female production workers as a</u> <u>percent of all production workers</u>
Total manufacturing (236,290 production workers)	28.2%
(2442) Women's clothing contractors	91.3
(2480) Foundation garments	89.6
(2491) Fabric gloves	83.6
(2450) Children's clothing	80.5
(2441) Women's clothing	79.6
(3997) Umbrellas and similar products	76.7
(2499) Miscellaneous clothing	74.1
(2432) Men's clothing contractors	72.3
(2431) Men's clothing	66.6
(2390) Knitted goods	66.4
(2470) Hats and caps	65.4
(2310) Hosiery products	65.3
(3989) Pens and pencils	65.1
(2299) Miscellaneous textile products	64.4
(1750) Leather gloves	62.0
(3770) Cosmetics and toilet preparations	60.7
(3981) Buttons, buckles and fasteners	60.1
(2230) Cotton and jute bags	59.2
(1530) Cigars, cigarettes and kindred products	58.1
(2120) Thread	57.5
(2292) Embroideries, pleatings and hem-stitchings	55.7
(1799) Miscellaneous leather goods	55.6
(3984) Artificial flowers and feathers	54.7
(1280) Biscuits	54.3
(3932) Toys and games	52.7
(2210) Canvas products	51.3
(3390) Miscellaneous electrical products	50.0

Source: D.B.S., Manufacturing Industries of Canada, 31-205

TABLE 54

PERCENTAGE DISTRIBUTION OF FEMALE PRODUCTION WORKERS IN
MANUFACTURING INDUSTRIES, ANNUAL AVERAGE FOR 1961-64

ONTARIO

<u>Name of industry</u>	<u>Percent of all female production workers in manufacturing</u>
Total manufacturing (98,846 women)	100.0%
(3350) Electronic equipment	6.1
(2431) Men's clothing	5.9
(1740) Leather footwear	4.3
(2390) Knitted goods	4.0
(2441) Women's clothing	3.9
(1120) Canned fruits and vegetables	3.8
(2860) Commercial printing	3.6
(3250) Motor vehicle parts and accessories	2.8
(1310) Candy products	2.4
(3390) Miscellaneous electrical products	2.3
(3850) Plastic goods and parts	1.9
(3360) Electrical machinery and equipment	1.7
(2740) Miscellaneous paper products	1.6
(1011) Meat packing and slaughtering	1.6
(1290) Bakery products	1.5
(2310) Hosiery products	1.5
(3340) Radios, television sets and record players	1.5
(3040) Metal stamping, pressing and coating	1.5
(3811) Instruments and kindred products	1.5
(1280) Biscuits	1.4
(3932) Toys and games	1.3
(2454) Children's clothing	1.3
(2731) Folding and set-up paper boxes	1.3
(3740) Pharmaceutical and medicinal products	1.3
(3310) Small electrical appliances	1.2
(1392) Miscellaneous food products	1.2

...cont'd

TABLE 54 (cont'd)

PERCENTAGE DISTRIBUTION OF FEMALE PRODUCTION WORKERS IN
MANUFACTURING INDUSTRIES, ANNUAL AVERAGE FOR 1961-64

ONTARIO

<u>Name of industry</u>	<u>Percent of all female production workers in manufacturing</u>
(1799) Miscellaneous leather goods	1.1%
(2480) Foundation garments	1.1
(1930) Wool spinning	1.1
(2299) Miscellaneous textile products	1.0
(3090) Miscellaneous metallic products	1.0
(1970) Wool yarn	1.0
Other industries	31.3

Source: D.B.S., Manufacturing Industries of Canada, 31-206

TABLE 55

FEMALE PRODUCTION WORKERS AS A PERCENT OF ALL PRODUCTION WORKERS IN
MANUFACTURING INDUSTRIES WHERE THEY PREDOMINATE OVER MALES,
ANNUAL AVERAGE FOR 1961-64

ONTARIO

<u>Name of industry</u>	<u>Female production workers as a percent of all production workers</u>
Total manufacturing (370,458 production workers)	21.1%
(2480) Foundation garments	88.7
(2450) Children's clothing	87.6
(3983) Hair goods	86.5
(2491) Fabric gloves	82.9
(2442) Women's clothing contractors	79.2
(3989) Pens and pencils	75.6
(2140) Narrow fabrics	75.5
(2441) Women's clothing	74.2
(2499) Miscellaneous clothing	74.0
(2390) Knitted goods	72.9
(2299) Miscellaneous textile products	70.1
(2432) Men's clothing contractors	70.1
(2431) Men's clothing	69.1
(2292) Embroideries, pleatings and hem-stitchings	69.0
(2230) Cotton and jute bags	68.9
(1930) Wool spinning	67.4
(2310) Hosiery products	67.4
(2291) Automobile fabric accessories	66.9
(3812) Clocks and watches	66.0
(1280) Biscuits	65.8
(3932) Toys and games	62.9
(1799) Miscellaneous leather goods	61.1
(1750) Leather gloves	60.1
(3813) Orthopaedic and surgical appliances	59.8
(2120) Thread	59.7

.....cont'd

TABLE 55 (cont'd)

FEMALE PRODUCTION WORKERS AS A PERCENT OF ALL PRODUCTION WORKERS IN
MANUFACTURING INDUSTRIES WHERE THEY PREDOMINATE OVER MALES,
ANNUAL AVERAGE FOR 1961-64

ONTARIO

<u>Name of industry</u>	<u>Female production workers as a percent of all production workers</u>
(3350) Electronic equipment	56.3%
(1740) Leather footwear	55.6
(1310) Candy products	55.4
(1110) Prepared fish products	54.3
(1530) Cigars, cigarettes and kindred products	54.1
(3996) Statuary, art goods and novelties	53.5
(3993) Smokers' supplies	53.5
(3999) Other miscellaneous products	52.9
(2680) Lamps and shades	51.3
(2210) Canvas products	51.2
(2470) Hats and caps	51.0

Source: D.B.S., Manufacturing Industries of Canada, 31-206

SIMPLE CORRELATION COEFFICIENTS BETWEEN THE PROPORTION OF FEMALE EMPLOYMENT IN EACH INDUSTRY
(AVERAGE, 1961-1964) AND SIX OTHER VARIABLES (MALES AND FEMALES, AVERAGE, 1961-1965), MANUFACTURING ACTIVITY

Name of other variables (1)	Correlation Coefficients (r)		
	Quebec (2)	Ontario	Canada (Canada-Quebec)
Size	-0.193	-0.189	-0.215
Productivity	-0.221	-0.329	-0.291
Non-wage productivity	-0.162 (NS)	-0.269	-0.208
Average hourly earnings	-0.572	-0.696	-0.749
Wages share (2)	.122 (NS)	.131 (NS)	.134 (NS)
Wages input	.145 (NS)	.212	.174
Critical r value (95%)	.167	.157	.167
Number of observations (industries)	136	154	171
			136

- (1) Size : value added per establishment
 Productivity : value added per man-hour paid
 Non-wage productivity : (value added-wages) per man-hour paid
 Average hourly earnings : wages per man-hour paid
 Wages share : wages/value added
 Wages input : wages/value of shipments of goods

(2) (NS): not statistically significant at the 95% confidence level

TABLE 59

REGRESSION EQUATIONS AND PROJECTION OF FEMALE EMPLOYMENT PERCENTAGE
DISTRIBUTIONS IN CANADA BY OCCUPATION GROUP, SECTOR AND REGION

G R O U P	Independent variable estimated parameter		Correlation Coefficient (R)	1980 Projection
	Constant term	Time (3)		
<u>Occupation group</u>				100.0%
Managers (1)	3.7			3.7
Professionals and technicians	11.3	.399	0.969	22.5
Service workers	23.5	.079	0.637	25.7
Saleswomen	10.5	-.137	0.959	6.7
Production workers	15.6	-.320	0.945	6.6
Office workers (1)	30.2			30.2
Farm workers (1)	3.3			3.3
Other occupations (2)	1.3			1.3
<u>Sector</u>				100.0
Personal, Recreational, Community and Business Services	33.8	.815	0.992	56.6
Transportation and Communications	5.0	-.126	0.963	1.5
Wholesale and Retail Trade	21.3	-.241	0.987	14.6
Manufacturing	23.7	-.476	0.960	10.4
Public administration (1)	4.6			4.6
Agriculture (1)	3.3			3.3
Finance (1)	6.5			6.5
Other sectors (2)	2.5			2.5
<u>Region</u>				100.0
Atlantic (1)	7.9			7.9
Quebec (1)	27.3			27.3
Ontario	41.0	-.164	0.662	36.4
Prairies (2)	17.2			17.2
British Columbia	7.8	.121	0.752	11.2

(1) The 1953-67 average was used for this group. Regression analysis was deemed unnecessary because no trend was observed graphically.

(2) Obtained by difference: 100% minus the sum for the other sub-groups.

(3) Annual data: time = 0 in 1952; time = 28 in 1980.

TABLE 60

PERCENTAGE DISTRIBUTION OF TOTAL FEMALE EMPLOYMENT BY OCCUPATION
GROUP, BY SECTOR OF THE ECONOMY AND BY REGION

<u>Occupation groups</u>	<u>1967</u>	<u>1970</u>	<u>1975</u>	<u>1980</u>
Managers	3.7%	3.7%	3.7%	3.7%
Professionals and technicians	17.2	18.5	20.5	22.5
Service workers	24.3	24.9	25.3	25.7
Saleswomen	8.4	8.0	7.3	6.7
Production workers	11.2	9.8	8.2	6.6
Office workers	30.7	30.2	30.2	30.2
Farm workers	3.0	3.3	3.3	3.3
Other occupations	1.6	1.6	1.5	1.3
<u>Sector</u>				
Community, Recreational, Business and Personal Services	45.6	48.5	52.5	56.6
Transportation and communica- tions	3.2	2.7	2.1	1.5
Wholesale and Retail Trade	17.7	17.0	15.8	14.6
Manufacturing	17.2	15.1	12.8	10.4
Public Administration	4.6	4.6	4.6	4.6
Agriculture	3.1	3.3	3.3	3.3
Finance	6.4	6.5	6.5	6.5
Other sectors	2.0	2.3	2.4	2.5
<u>Region</u>				
Atlantic	7.8	7.9	7.9	7.9
Quebec	27.7	27.3	27.3	27.3
Ontario	38.4	38.1	37.2	36.4
Prairies	16.2	16.7	17.0	17.2
British Columbia	9.8	10.0	10.6	11.2

Note: Actual data for 1967 and projections for 1970, 75 and 80.

TABLE 61

DERIVATION OF FEMALE EMPLOYMENT FOR 1980 FROM THE PROJECTED FEMALE LABOUR FORCE FOR 1980

a) Labour force (in thousands)					
Male	7,017	(Economic Council of Canada Projection)			
Female	4,095	(Authors projection)			
Total	11,112				
b) Unemployment					
	Number	(in thousands)	Rate		
Male	421		6%		
Female	123		3%	i)	
	205		5%	ii)	
c) Employment (in thousands)					
	3% Female Unemployment Rate			5% Female Unemployment Rate	
Male	6,596			6,596	
Female	3,972			3,890	
Total	10,568			10,486	
d) Female employment as a percent of total employment	37.6%				37.1%

TABLE 62

TOTAL PRODUCTION OF GOODS, TOTAL PRODUCTION OF SERVICES AND PRODUCTION
PER WORKER IN THE PRIVATE SECTOR OF THE ECONOMY, 1953-66

	<u>Total production (1)</u>		<u>Production per worker (2)</u>
	<u>Goods</u>	<u>Services</u>	(1949 = 100.0)
1953	\$10.397	\$8.568	122.1
1954	9.885	8.681	119.5
1955	11.159	9.286	130.7
1956	12.328	9.936	137.5
1957	12.096	10.167	134.7
1958	12.161	10.383	140.0
1959	12.818	10.971	145.5
1960	12.972	11.210	148.3
1961	13.118	11.544	150.3
1962	14.227	12.040	157.2
1963	15.150	12.597	163.5
1964	16.196	13.262	168.1
1965	17.492	14.000	174.3
1966	18.938	14.780	180.7

(1) In billions of constant 1949 dollars

(2) In the private sector of the economy

Source: D.B.S., National Accounts and Balance of Payments Division, Industrial Output Section; Industry Division, Productivity Research and Analysis Section.

REGRESSION EQUATIONS AND PROJECTION OF TOTAL PRODUCTION OF GOODS AND SERVICES, PRODUCTIVITY,
FEMALE SHARE OF TOTAL EMPLOYMENT AND TOTAL EMPLOYMENT IN CANADA

INDEPENDENT VARIABLE ESTIMATED PARAMETER

DEPENDENT VARIABLE (1)	Constant term	Time	MPR	FPR	Correlation Coefficient		1980 Projection (2)	1966 Actual Value	Relative Increase % (80-66)
					Multiple Residuals				
					(R)	(RHO)			
(LOG) Production of Goods	3.963 (log a).02109 (log b) (a=9,178) (b=1.050)				.932	.428	35,810	18,938	89.1
(LOG) Production of Services	3.912 (log a).01799 (log b) (a=8,157) (b=1.042)				.995	.425	26,060	14,780	76.3
Total Production (3)							61,870	33,718	83.5
Productivity (Index: 1949=100)	114.6	4.46			.988	0	239.5	180.7	32.5
Female Share of Total Employment (%)	27.8		-.239	.650	.961	.809	38.2	30.3	26.1
(LOG) Total Employment (thousands)	3.670 (log a).01247 (log b) (a=4,678) (b=1.029)				.951	.706	10,450	7,152	46.1

(1) LOG=logarithm of dependent variable for production of goods and services and total employment. The exponential model used in these cases was $Y = a(b)^t$ or $\log Y = (\log a) + t(\log b)$ where Y = dependent variable, t = time (independent variable) and "a" and "b" are parameters; the estimated values of log a and log b are given above. Production in millions of constant 1949 dollars.

(2) For 1980, MPR (male participation rate) = 77.7%, FPR (female participation rate) = 44.6% and time = 28. Time origin $t = 0$ in 1952 (annual data).

(3) 1980 projection obtained from the sum of goods and services.

TABLE 64

EMPLOYMENT IN 1980A-Relative Increase in Production, Productivity and Employment from 1966 to 1980

<u>1966-80 Relative Increase in</u>	<u>Sector of the Economy</u>	
	<u>Private</u>	<u>Public</u>
Production	83.5%	83.5%
Productivity	32.5	0.0
Employment	38.5	83.5

B-Total, Male and Female Employment in 1980

(in thousands)

Total (private and public) employment	10,485 (1)
Female employment	4,005 (2)
Male employment	6,480

C-Unemployment in 1980

	<u>Labour Force (3)</u> (in ,000)	<u>Unemployment (4)</u> (in ,000)	<u>Unemployment rate</u> (in %)
Total	11,112	627	5.6
Female	4,095	90	2.2
Male	7,017	537	7.6

- (1) Obtained by applying the projected percentage increase in total employment (46.6%) to the actual 1966 figure for total employment (7,152 thousands). This percentage increase is the weighted average of the percentage increase in private employment (38.5%) and the percent increase in public employment (83.5%), the weights being 0.181 for public employment and 0.819 for private employment in 1966.
- (2) Obtained by multiplying the 1980 total employment (10,485 thousands) by the 1980 estimated female share of total employment (38.2%).
- (3) Our projection for females and the Economic Council of Canada projection for males.
- (4) Labour force minus employment.

TABLE 64 (Continued 1)

EMPLOYMENT IN 1980D- Female Unemployment by Region in 1980 : Original Results

Region	Labour Force (5)	Employment (6)	Unemployment		
			Level (7)	Rate	Rate Relative (8) Error
	(,000)	(,000)	(,000)	(%)	(%)
Atlantic (9)	276	316	-40	-14.5	105
Quebec	1,156	1,093	63	5.5	250
Ontario	1,476	1,458	18	1.2	1155
Prairies	717	689	28	3.9	460
British Columbia	469	449	20	4.3	375
CANADA	4,094	4,005	89	2.2	525

(5) Our projection; see Table 33.

(6) Obtained by applying the projected regional employment distribution (Table 59) to the projected total female employment in Canada in 1980 (4,005 thousands, Part B, above).

(7) Labour force minus employment.

(8) See Table 72, Part D.

(9) The negative unemployment rate is subject to a 105% projection error (standard error over projection) and therefore has a 30% chance of actually being higher than plus 1% (positive unemployment).

.....cont'd 2

TABLE 64

(Continued 2)

EMPLOYMENT IN 1980E-Female Unemployment by Region in 1980 : Revised Results

Region	Unemployment Rate		Labour Force (11) (,000)	Revised	
	(%)			Employment (12)	Unemployment (13)
	1953-1967 Average	1980 (10)		(,000)	(,000)
Atlantic	2.8	2.1	276	270	6
Quebec	3.8	2.9	1,156	1,123	33
Ontario	2.5	1.9	1,476	1,448	28
Prairies	1.9	1.4	717	707	10
British Columbia	3.9	3.0	469	455	14
CANADA	2.9	2.2	4,094	4,003	91

(10) 1953-1967 average X Canada (1980)/Canada (1953-1967 average).

(11) See Table 33.

(12) Labour force X (100 - 1980 unemployment rate).

(13) Labour force minus employment.

TABLE 65

PROJECTED FEMALE EMPLOYMENT FOR 1980 BY OCCUPATION GROUP,
SECTOR OF THE ECONOMY AND REGION

<u>Occupation Group</u>	Actual 1967 (in ,000)	Projected 1980 (in ,000)	Change 1967-80 (in %)
Managers	86	148	72.1
Professionals and technicians	395	901	128.1
Services workers	558	1,029	84.4
Saleswomen	192	268	39.6
Production workers	257	264	2.7
Office workers	704	1,210	71.9
Farm workers	68	132	94.1
Other occupations	36	52	44.4
<u>Sector</u>			
Community, Recreational, Business and Personal Services	1,048	2,267	116.3
Transportation and Communications	74	60	-18.9
Wholesale and Retail Trade	407	585	43.7
Manufacturing	394	417	5.8
Public Administration	106	184	73.8
Agriculture	72	132	83.3
Finance	148	260	75.7
Other sectors	47	100	112.8
<u>Region (Original Results)</u>			
Atlantic	179	316	76.5
Quebec	636	1,093	71.9
Ontario	881	1,458	65.5
Prairies	373	689	84.7
British Columbia	226	449	98.7
<u>Total</u>	2,296	4,005	74.4

.....cont'd

TABLE 65 (cont'd)

PROJECTED FEMALE EMPLOYMENT FOR 1980 BY OCCUPATION GROUP,
SECTOR OF THE ECONOMY AND REGION

	Actual 1967 (in ,000)	Projected 1980 (in ,000)	Change 1967-80 (in %)
<u>Region (Revised Results) (1)</u>			
Atlantic	179	270	50.8
Quebec	636	1,123	76.6
Ontario	881	1,448	64.4
Prairies	373	707	89.5
British Columbia	226	455	101.3
CANADA	2,295	4,003	74.4

(1) See Table 64, Part E.

TABLE 66

FEMALE EMPLOYMENT BY OCCUPATION GROUP,
SECTOR OF THE ECONOMY AND REGION

(in ,000)

	<u>1967</u>	<u>1970</u>	<u>1975</u>	<u>1980</u>
<u>Occupation Group</u>				
Managers	86	95	119	148
Professionals and technicians	395	473	657	901
Service workers	558	637	811	1,029
Saleswomen	192	205	234	268
Production workers	257	251	263	264
Office workers	704	772	968	1,210
Farm workers	68	84	106	132
Other occupations	36	41	48	52
<u>Sector</u>				
Community, Recreational, Business and Personal Services	1,048	1,240	1,682	2,267
Transportation and Communications	74	69	67	60
Wholesale and Retail Trade	407	435	506	585
Manufacturing	394	386	410	417
Public Administration	106	118	147	184
Agriculture	72	84	106	132
Finance	148	166	208	260
Other sectors	47	59	77	100
<u>Region (Original Results)</u>				
Atlantic	179	202	253	316
Quebec	636	698	875	1,093
Ontario	881	974	1,192	1,458
Prairies	373	427	545	689
British Columbia	226	256	340	449
<u>Total</u>	2,296	2,557	3,204	4,005

Note: -Details may not add up to total because of rounding.

-Actual data for 1967 and projections for 1970, 75 and 80.

.....Cont'd

TABLE 66 (cont'd)

FEMALE EMPLOYMENT BY OCCUPATION GROUP,
SECTOR OF THE ECONOMY AND REGION

	<u>1967</u>	<u>1970</u>	<u>1975</u>	<u>1980</u>
<u>Region (Revised Results)</u>				
Atlantic	179	189	227	270
Quebec	636	703	886	1,123
Ontario	881	969	1,186	1,448
Prairies	373	435	561	707
British Columbia	226	261	342	455
	<hr/>	<hr/>	<hr/>	<hr/>
CANADA	2,295	2,557	3,202	4,003

Note: Projections for 1970 and 1975 derived from a projection of total employment obtained from a regression equation (last line of Table 67); projections for 1980 derived from the "production-productivity increases" method. Both methods yield similar results.

TABLE 67

INTERMEDIATE PROJECTIONS FOR TOTAL PRODUCTION, PRODUCTIVITY AND TOTAL EMPLOYMENT

	Actual	Projections for		
		1970	1975	1980
Production of Goods (1)	\$18,938	22,010	28,060	35,810
Production of Services (1)	14,780	17,210	21,170	26,060
Total Production (1) (2)	33,718	39,220	49,230	61,870
Productivity (Index: 1949=100)	180.7	194.9	217.2	239.5
Female Share of Total Employment (3)	30.3%	32.7%	35.5%	38.2%
Total Employment (in thousands)	7,152	7,843	9,053	10,450

(1) In millions of constant 1949 dollars.

(2) Projections obtained from the sum of goods and services.

(3) The Economic Council of Canada male participation rate projections for 1970 (77.2%), 1975 (77.1%) and 1980 (77.7%) were used to obtain the female share of total employment projections. Time t=0 in 1952, 18 in 1970, 23 in 1975 and 28 in 1980.

TABLE 68

EFFECT ON AVERAGE EARNINGS OF THE PROJECTED CHANGE IN THE PERCENTAGE
DISTRIBUTION OF TOTAL FEMALE EMPLOYMENT BY OCCUPATION GROUP

<u>OCCUPATION GROUP</u>	<u>Average Earnings</u> <u>1961 (1)</u>	<u>Employment Percentage</u> <u>Distribution</u>	
		<u>Actual</u> <u>1961</u>	<u>Projected</u> <u>1980</u>
Managers	\$3,207	3.7%	3.7%
Professionals and Technicians	2,996	15.0	22.5
Service Workers	1,240	24.9	25.7
Saleswomen	1,367	9.4	6.7
Production Workers	1,757	12.0	6.6
Office Workers	2,340	30.0	30.2
Farm Workers	607	3.4	3.3
Other occupations	1,913	<u>1.6</u>	<u>1.3</u>
		100.0	100.0
Average, all occupations			
-1961 distribution	\$1,930		
-1980 distribution	\$2,136		

(1) 1961 Census of Canada (D.B.S., 94-509) estimates for the female labour force. They are used as a proxy for the employed females earnings.

TABLE 69

PROJECTED MINIMUM EDUCATIONAL ATTAINMENT OF FEMALE WORKERS FOR 1980

	Complete Secondary Education or more			Complete University Education		
	<u>Percent of Group in 1961</u>	<u>Number in 1980 (in ,000)</u>	<u>Percent of Group in 1980</u>	<u>Percent of Group in 1961</u>	<u>Number in 1980 (in ,000)</u>	<u>Percent of Group in 1980</u>
Managers	32.9%	49	32.9%	3.0%	4	3.0%
Professionals and technicians	81.3	733	81.3	13.9	125	13.9
Service workers	12.9	133	12.9	0.4	4	0.4
Saleswomen	22.0	59	22.0	0.5	1	0.5
Production workers	7.3	19	7.3	0.1	0	0.1
Office workers	46.3	560	46.3	1.1	13	1.1
Farm workers	8.4	11	8.4	0.2	0	0.2
Other occupations	32.1	17	32.1	0.9	0	0.9
Total, All occupations	<u>34.0</u>	1581	<u>39.5</u>	<u>2.7</u>	147	<u>3.7</u>

TABLE 70

COEFFICIENTS OF VARIATION OF PARAMETERS OF REGRESSION EQUATIONS
AND OF PROJECTIONS OF FEMALE EMPLOYMENT PERCENTAGE DISTRIBUTIONS AND
LEVELS IN CANADA BY OCCUPATION GROUP, SECTOR AND REGION

G R O U P	<u>Coefficient of Variation (% Standard Error/Mean)</u>			
	<u>Estimated Parameter</u>		<u>1980 Female Employment</u>	
	<u>Constant Term</u>	<u>Time</u>	<u>Percentage Distribution</u>	<u>Level (3)</u>
<u>Occupation Group</u>				(10.7)
Managers	(1)		1.7	12.4
Professionals and Technicians	7.7	7.1	2.6	13.3
Service Workers	3.5	33.5	2.1	12.8
Saleswomen	3.3	8.2	3.4	14.1
Production Workers	6.1	9.6	9.5	20.2
Office Workers	(1)		0.5	11.2
Farm Workers	(1)		1.8	12.5
Other Occupations	(2)		81.0	91.7
<u>Sector</u>				(10.7)
Personal, Recreational, Community and Business Services	2.6	3.6	1.1	11.8
Transportation and Communications	6.0	7.8	13.4	24.1
Wholesale and Retail Trade	1.6	4.5	1.5	12.2
Manufacturing	5.0	8.1	7.6	18.3
Public Administration	(1)		1.2	11.9
Agriculture	(1)		2.7	13.4
Finance	(1)		0.9	11.6
Other Sectors	(2)		41.5	52.2
<u>Region</u>				(10.7)
Atlantic	(1)		1.2	11.9
Quebec	(1)		1.1	11.8
Ontario	3.9	31.4	2.9	13.6

.....cont'd

TABLE 70 (cont'd)

COEFFICIENTS OF VARIATION OF PARAMETERS OF REGRESSION EQUATIONS
AND OF PROJECTIONS OF FEMALE EMPLOYMENT PERCENTAGE DISTRIBUTIONS AND
LEVELS IN CANADA BY OCCUPATION GROUP, SECTOR AND REGION

G R O U P	<u>Coefficient of Variation (% Standard Error/Mean)</u>			
	<u>Estimated Parameter</u>		<u>1980 Female Employment</u>	
	<u>Constant Term</u>	<u>Time</u>	<u>Percentage Distribution</u>	<u>Level (3)</u>
<u>Region (cont'd)</u>				
Prairies	(2)		7.2	17.9
British Columbia	10.9	25.2	5.0	15.7

-
- (1) The standard error of the 1953-1967 average was used for this group (15 sets of data).
- (2) Square root of sum of variances of other groups over projected value.
- (3) Sum for percentage distribution and total female employment: 10.7% (see Table 72, Part B).

TABLE 71

COEFFICIENTS OF VARIATION OF PARAMETERS OF REGRESSION EQUATIONS
AND OF PROJECTIONS OF TOTAL PRODUCTION OF GOODS AND SERVICES, PRODUCTIVITY,
FEMALE SHARE OF TOTAL EMPLOYMENT AND TOTAL EMPLOYMENT IN CANADA

COEFFICIENT OF VARIATION (% STANDARD ERROR/MEAN)					
INDEPENDENT VARIABLE ESTIMATED PARAMETER					
DEPENDENT VARIABLE (1)	Constant Term	Time		Participation Rate	
		1 + Rate	Rate	Male	Female
Production of Goods	11.6	0.6	12.0		
Production of Services	4.1	0.3	7.1		
Total Production (2)					
Productivity	4.7		4.5 (slope)		
Female Share of Total Employment	0.1			47.7	10.0
Male Share of Total Employment					
Total Employment	5.8	0.3	10.3		

(1) There were 14 sets of data (1953-1966) on production variables and productivity and 15 (1953-1967) on employment variables.

(2) 1980 projection coefficient obtained from the coefficients on goods and services.

TABLE 72

COEFFICIENTS OF VARIATION FOR PROJECTED EMPLOYMENT
AND UNEMPLOYMENT IN 1980
(in percent)

A-Relative Errors for Production, Productivity and Employment in 1980

	<u>Sector of the Economy</u>	
	<u>Private</u>	<u>Public</u>
Production (1)	7.0	7.0
Productivity (1)	<u>1.7</u>	<u>0.0</u>
Employment	8.7	7.0

B-Relative Errors for Total, Male and Female Employment in 1980

Total (private and public) employment (2)	8.4
Female employment (3)	10.7
Male employment (3)	9.6

C-Relative Errors for Unemployment in 1980, Canada

	<u>Labour Force (4)</u>	<u>Unemployment (5)</u>	<u>Unemployment Rate (6)</u>
Total	4.2	145	150
Female	4.2	520	525
Male	4.2	130	135

(1) See Table 71

(2) This percentage is the weighted average of the percentage in private employment (8.7%) and the percentage in public employment (7.0%), the weights being 0.181 for public employment and 0.819 for private employment in 1966.

(3) .Obtained by adding the relative error for the 1980 total employment (8.4%) to the relative error for the 1980 estimated share of total employment (2.3% for females and 1.2% for males; see Table 71).

(4) Our estimation for females (see Table 39) and assuming the same for the Economic Council of Canada projection error for males.

(5) Square root of sum of variances for labour force and employment over projected unemployment. Rounded-off to the nearest multiple of 5.

(6) Sum of relative errors for unemployment and labour force. Rounded-off to the nearest multiple of 5.

.....cont'd

TABLE 72 (Continued)

COEFFICIENTS OF VARIATION FOR PROJECTED EMPLOYMENT
AND UNEMPLOYMENT IN 1980
(in percent)

D-Relative Errors for Female Unemployment in 1980, Regions

<u>Region</u>	<u>Labour Force (7)</u>	<u>Employment (8)</u>	<u>Unemployment</u>	
			<u>Number (9)</u>	<u>Rate</u>
Atlantic	5.4	11.9	100	105
Quebec	7.2	11.8	240	250
Ontario	3.9	13.6	1150	1155
Prairies	3.8	17.9	455	460
British Columbia	5.4	15.7	370	375

(7) See Table 39.

(8) See Table 70.

(9) Square root of sum of variances for labour force and employment over projected unemployment. Rounded-off to the nearest multiple of 5.

TABLE 73

SIGNIFICANCE OF CALCULATED VON NEUMANN RATIOS

ALL REGRESSION EQUATIONS

(A = for untransformed variables

a n d

B = for transformed variables)

EQUATION	Number of Observations	Number of signifi- cant variables entered		Calculated Von Neumann Ratios		Theil and Nagar 5% Significance Points (2)		Calculated Rho (3)		Serial correlation on last step retained (4)	
		A	B	d (1)		A		By Regression 1-d/2		A	B
				A	B	A	B	A	B		
Single	36	35	6	1.11	1.56	1.79	1.89	0.434	.445	-	Small (6)
Married (5)	36	35	5	1.11	1.33	1.72	1.80	0.590	.445	-	Small (6)
Others	36	35	3	0.98	1.63	1.59	1.65	0.485	.510	-	Small (6)
Atlantic	15	14	2	1.32	1.34	1.36	1.53	0.298	.340	Small	-
Quebec	15	14	1	0.60	1.59	1.36	1.35	0.584	.700	-	None
Ontario	15	-	-	1.59	-	1.53	-	-	.205	None	-
Prairies	15	14	4	1.86	1.32	1.94	1.99	0.048	.070	Small	-
B.C.	15	14	2	0.68	1.43	1.36	1.53	0.559	.660	-	Small
14-19	58	57	2	1.20	1.58	1.69	1.64	0.390	.400	-	Small
20-24	58	57	2	0.89	1.47	1.69	1.64	0.554	.555	-	Small
25-44	58	57	1	0.49	2.14	1.61	1.61	0.735	.755	-	None
45-64	58	57	1	0.74	2.08	1.61	1.61	0.624	.630	-	None
65-+	58	57	1	0.55	2.23	1.65	1.61	0.740	.725	-	None
14-+	58	57	3	0.40	2.10	1.61	1.68	0.782	.800	-	None
Age Group-I	58	57	2	0.74	1.62	1.61	1.64	0.628	.630	-	Small
14-19	58	57	3	0.79	1.39	1.73	1.68	0.605	.605	-	Small
20-24	58	57	2	0.36	1.77	1.65	1.64	0.813	.820	-	None
25-44	58	57	1	0.74	2.04	1.61	1.64	0.624	.630	-	None
45-64	58	57	3	0.67	2.09	1.69	1.64	0.663	.665	-	None
65-+	58	57	2	0.24	1.42	1.65	1.72	0.881	.880	-	Small
14-+	58	57	4								

.....cont'd 1

TABLE 73 (continued 1)

SIGNIFICANCE OF CALCULATED VON NEUMANN RATIOS

ALL REGRESSION EQUATIONS

(A = for untransformed variables and B = for transformed variables)

EQUATION	Number of Observations		Number of significant variables entered		Calculated Von Neumann Ratios d (1)		Theil and Nagar 5% Significance Points (2)		Calculated Rho (3)		Serial correlation on last step retained (4)	
	A	B	A	B	A	B	A	B	By Regression		A	B
									A	A		
25-34	15	14	1	1	0.60	1.74	1.36	1.35	0.734	.700	.130	None
35-44	15	14	1	1	1.02	1.43	1.36	1.35	0.277	.490	.285	Small
45-54	15	14	1	3	1.03	1.29	1.36	1.35	0.472	.485	.355	Small
55-64	15	-	1	-	1.37	-	1.36	-	-	.315	-	Small
Pro. + Tech.	15	-	1	-	1.84	-	1.36	-	-	.080	-	None
Serv. Work.	15	-	1	-	1.90	-	1.36	-	-	.050	-	None
Saleswomen	15	-	1	-	1.78	-	1.36	-	-	.110	-	None
Prod. Work.	15	14	1	1	1.13	1.67	1.36	1.35	0.334	.435	.165	Small
P.R.C.B. Ser.	15	14	1	1	1.12	1.32	1.36	1.35	0.429	.440	.340	Small
Trans. + Com.	15	14	1	1	1.28	1.92	1.36	1.35	0.275	.360	.040	Small
W. + R. Trade	15	-	1	-	1.88	-	1.36	-	-	.060	-	None
Manufac.	15	14	1	1	1.06	1.81	1.36	1.35	0.381	.470	.095	Small
Ontario	15	14	1	1	1.11	2.03	1.36	1.35	0.249	.445	-.015	Small
B.C.	15	14	1	1	0.79	1.35	1.36	1.35	0.618	.605	.325	-
Prod. Goods	14	13	1	1	1.06	1.30	1.35	1.34	0.428	.470	.350	Small
Prod. Ser.	14	13	1	1	1.13	1.36	1.35	1.34	0.425	.435	.320	None
Productivity	14	-	1	-	1.65	-	1.35	-	-	.175	-	None
F. Sh. T.E.	15	14	2	2	0.38	1.67	1.53	1.53	0.809	.810	.165	None
Tot. Empl.	15	14	1	1	0.57	1.49	1.36	1.35	0.706	.715	.255	None

TABLE 73 (continued 2)

$$(1) \quad d = \frac{\sum_{t=2}^n (u_t - u_{t-1})^2}{\sum_{t=1}^n u_t^2}$$

where d = Durbin-Watson statistic based on the Von Neumann Ratio;

u_t = estimate of the disturbance at time t;

\sum = greek letter sigma denoting a "sum";

n = number of observations;

t = time period (rank of an observation).

(2) From p. 802 of Theil, H. and Nagar, A.L., "Testing the Independence of Regression Disturbances", American Statistical Association Journal, 56 (1961), pp. 793-806. We can say, with a 5% risk of making type-I error, that there is serial correlation whenever d is smaller than or equal to the 5% significance point.

(3) By regression Rho is estimated from

$$u_t = \text{constant} + \text{Rho } (u_{t-1}).$$

An approximation of Rho can also be obtained from

$$\text{Rho} = 1 - d/2. \quad \text{Cf. Theil and Nagar, op. cit., pp. 803-804, where } d = Q \text{ and } \hat{\rho} = 1 - \frac{1}{2}Q.$$

See also Henshaw, Jr., Richard, C., "Testing Single-Equation Least Squares Regression Models for Autocorrelated Disturbances", Econometrica, 34 (1966), pp. 646-660. The regression estimate of Rho might (not too seriously, here) combine the two complications of lagged variables and autocorrelated residuals; cf. pp. 211-221 of Johnston, J., "Econometric Methods", McGraw-Hill, New York, 1963, 300 pages.

TABLE 73 (continued 3)

- (4) For female labour in the Atlantic Region and in the Prairies, or in the 35-44 and 45-54 age sub-groups, or being Production workers, or in the sectors of Personal, recreational, community and business services, Transportation and communications, Manufacturing or working in Ontario, the regression coefficients retained were those for the untransformed variables (A) because the regression estimates of Rho did not come out statistically significant. B-coefficients and standard errors were similar to A-results, none the less, in these cases.
- (5) For married females a "simulation approach" was used in order to reduce d with the transformed model. Originally, at that second stage, $Rho = 0.440$ and $d = 1.09 < 1.11$, the d-value in A, the first stage.
- (6) For marital status equations we have used dummy variables for quarters (taking on 0 and 1 values). Therefore, as illustrated by Henshaw, op. cit., p. 656, the Theil-Nagar (op. cit., p. 800) test overestimates the required significance points since the first and second differences of these explanatory dummy variables are necessarily not small in absolute value compared with their $\hat{\theta}-1$ range. Consequently, it is likely that serial correlation for these equations is not serious in step B (transformed variables). It should also be noted that the three calculated d-values, in B, all fall within the "region of ignorance" of the Durbin-Watson 5% significance points:
 $1.10 < 1.56 < 1.87$ for "single", $1.16 < 1.33 < 1.80$ for "married" and $1.28 < 1.63 < 1.65$ for "others".

TABLE 74

COEFFICIENTS OF VARIATION OF PROJECTED INCREASES,
ALL REGRESSION EQUATIONS

Marital Status	Equation	Percent Change 1967-1980	Coefficient of Variation of Percent Change 67-80 (%)	68% Confidence Interval of Percent Change 67-80	
				Lower Limit	Upper Limit
Single	Single	63.8	18.2	52.2	75.4
	Married	85.5	9.3	77.5	93.5
	Others	36.5	25.9	27.0	46.0
Atlantic Quebec Ontario Prairies B.C.	Atlantic	50.1	16.2	42.0	58.2
	Quebec	75.3	16.8	62.6	88.0
	Ontario	62.9	10.1	56.5	69.3
	Prairies	89.2	8.1	82.0	96.4
	B.C.	97.8	10.9	87.1	108.5
Age Group-I (1)	14-19	25.8	34.6	16.9	34.7
	20-24	66.7	8.3	61.2	72.2
	25-44	78.4	11.2	69.6	87.2
	45-64	93.4	5.0	88.7	98.1
	65-+	105.4	15.7	88.9	121.9
Sub-Group	14-+	73.1	10.0	65.8	80.4
	25-34	118.0	13.0	102.7	133.3
	35-44	48.6	12.2	42.7	54.5
	45-54	70.3	5.8	66.2	74.4
	55-64	126.3	3.8	121.5	131.1

.....cont'd 1

TABLE 74 (continued 1)

COEFFICIENTS OF VARIATION OF PROJECTED INCREASES,
ALL REGRESSION EQUATIONS

	Equation	Percent Change 1967-1980	Coefficient of Variation of Percent Change 67-80 (%)	68% Confidence Interval of Percent Change 67-80	
				Lower Limit	Upper Limit
Occupation Group	Managers	72.1	29.6	50.8	93.4
	Profess. & Tech.	128.1	23.7	97.7	158.5
	Service workers	84.4	27.9	60.9	107.9
	Saleswomen	39.6	49.8	19.9	59.3
	Prod. Workers	2.7	761.7	-17.9	23.3
	Office Workers	71.9	26.8	52.6	91.2
	Farm Workers	94.1	25.8	69.8	118.4
	Other occupations	44.4	298.0	-87.9	176.7
	C.R.B.P. Services	116.3	21.9	90.8	141.8
	Transport & Comm.	-18.9	103.4	-38.4	0.6
Sector	W. & R. Trade	43.7	40.1	26.2	61.2
	Manufacturing	5.8	331.8	-13.4	25.0
	Public Administration	73.8	28.1	53.1	94.5
	Agriculture	83.3	29.5	58.7	107.9
	Finance	75.7	26.9	55.3	96.1
	Other Sectors	112.8	98.7	1.5	224.1
	Atlantic	76.5 (50.8)	27.5	55.5	97.5
	Quebec	71.9 (76.6)	28.2	51.6	92.2
	Ontario	65.5 (64.4)	34.4	43.0	88.0
	Prairies	84.7 (89.5)	39.0	51.7	117.7
Region (2)	British Columbia	98.7 (101.3)	31.6	67.5	129.9
	Total	74.4 (74.4)	25.0	55.8	93.0

TABLE 74 (continued 2)

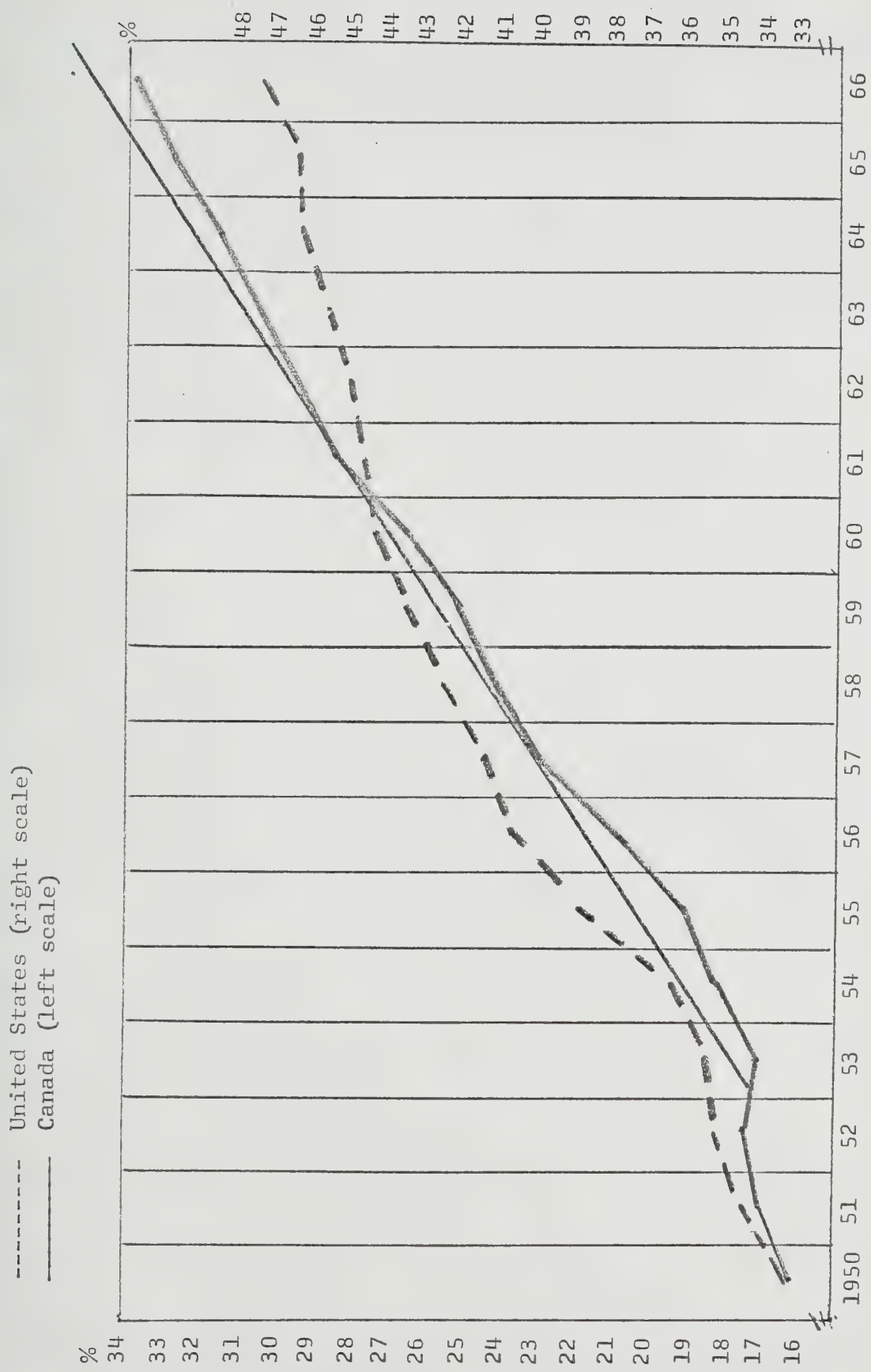
COEFFICIENTS OF VARIATION OF PROJECTED INCREASES,
ALL REGRESSION EQUATIONS

Equation	Percent Change 1966-1980	Coefficient of Variation of Percent Change 66-80 (%)	68% Confidence Interval of Percent Change 66-80	
			Lower Limit	Upper Limit
Production of Goods	89.1	25.0	66.8	111.4
Production of Services	76.3	9.7	68.9	83.7
Total Production	83.5	15.4	70.6	96.4
Productivity	32.5	6.9	30.3	34.7
Fem. Sh. of Total Empl.	26.1	11.1	23.2	29.0
Total Employment	46.1	15.2	39.1	53.1

(3) Other Variables

- (1) Age Group-II equations do not appear here because predictions of relative increases were only made with Age Group-I equations.
- (2) Percent increases shown between parentheses are from the "revised results" of Table 65. It can be seen that all revised results, except for the Atlantic Region, fall well within the 68% confidence interval calculated. In the case of the Atlantic Region, the revised increase (50.8%) falls well within a 95% confidence interval (34.5 - 118.5%).
- (3) Percent change between 1966 and 1980 (instead of 1967-1980).

FIGURE 15: PARTICIPATION RATE FOR FEMALES AGED 45 TO 64 YEARS



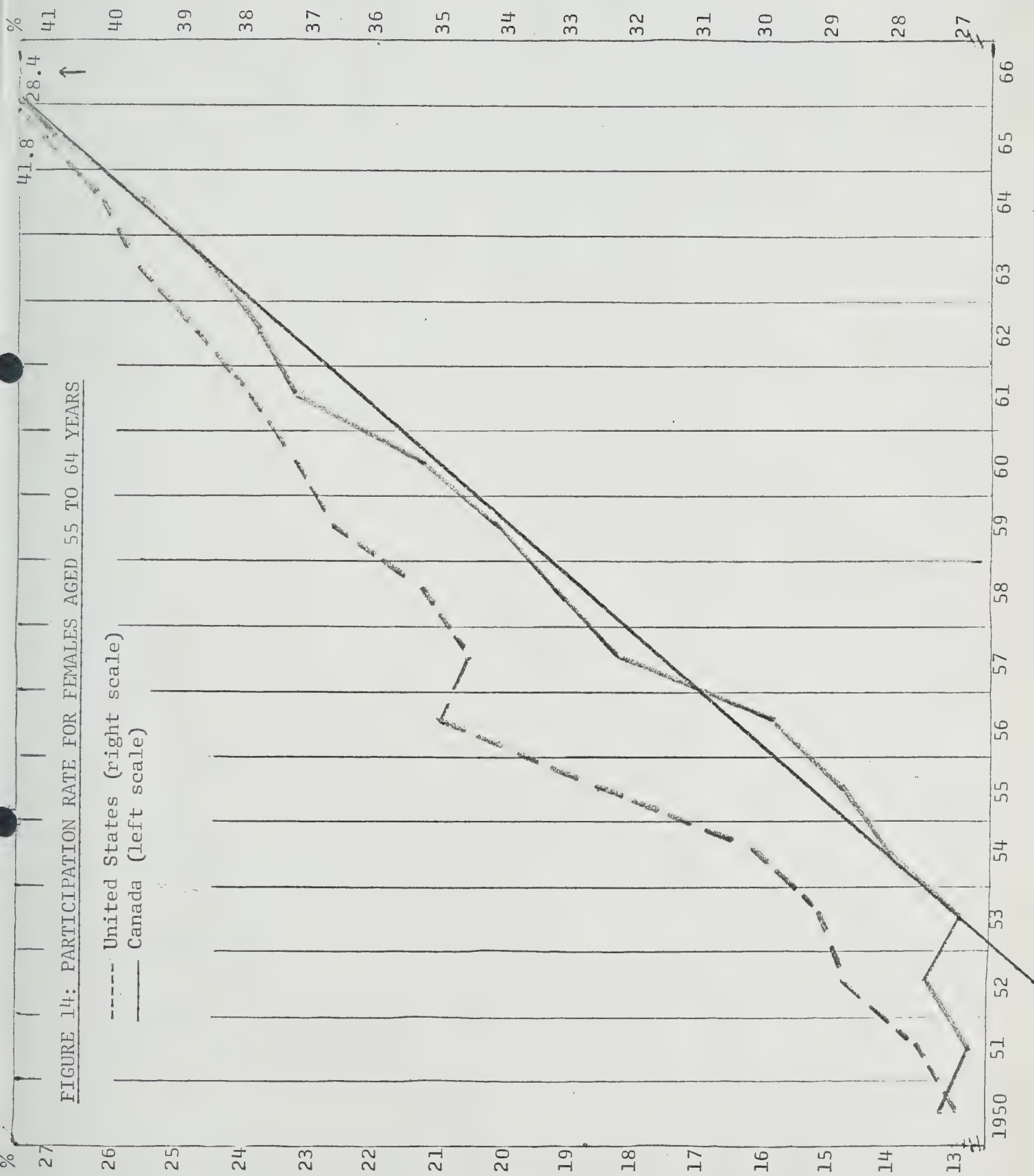
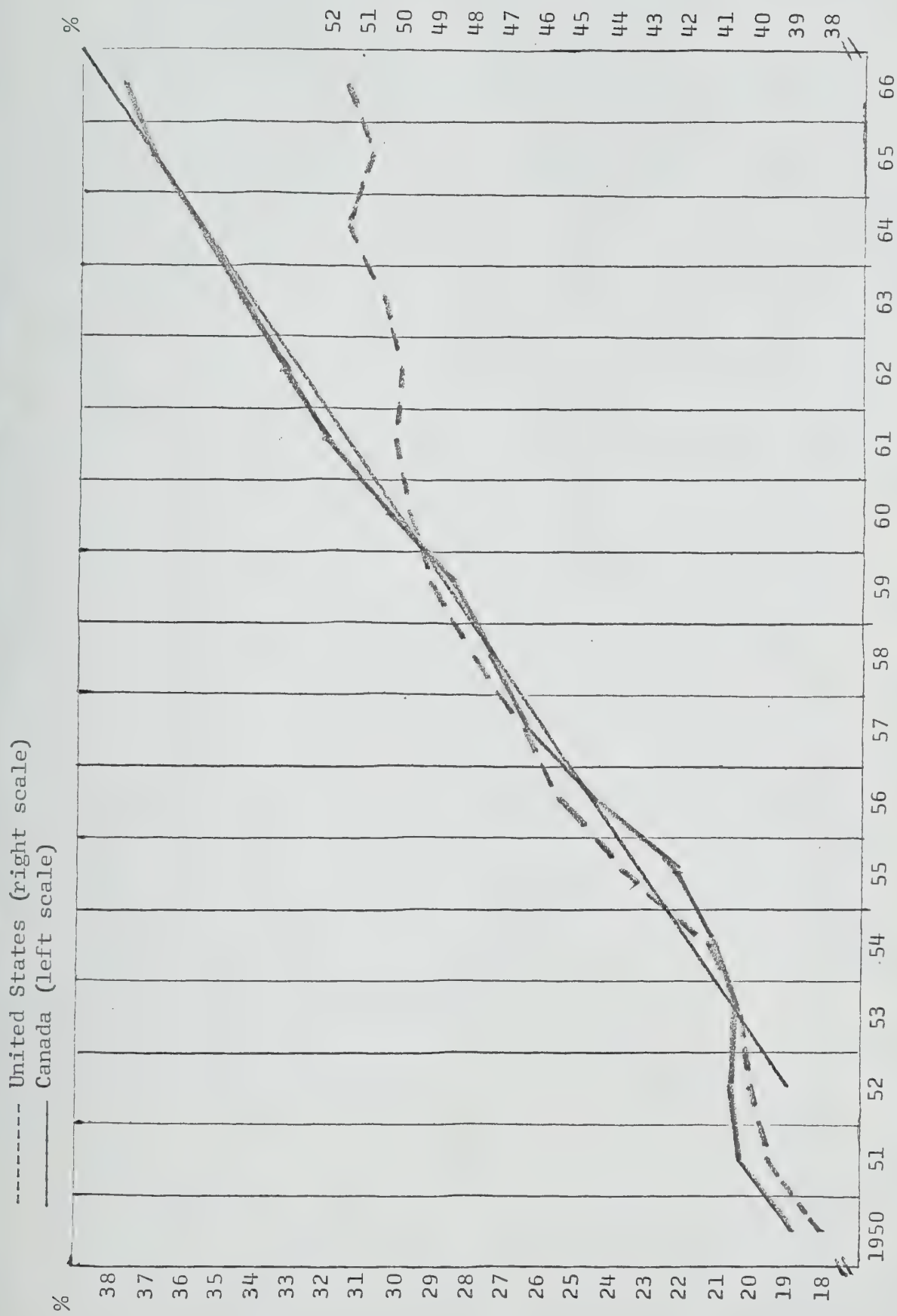
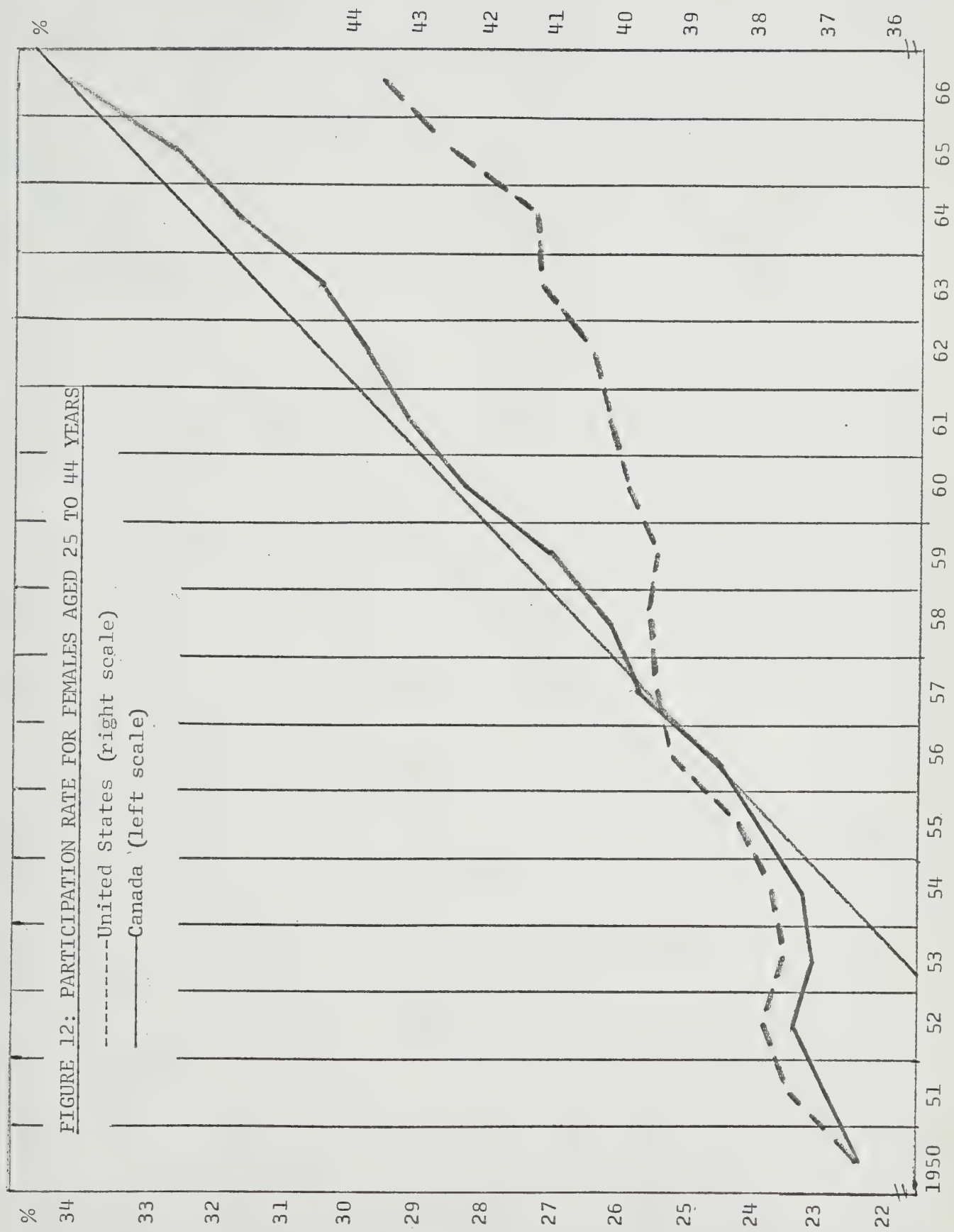


FIGURE 13: PARTICIPATION RATE FOR FEMALES AGED 45 TO 54 YEARS





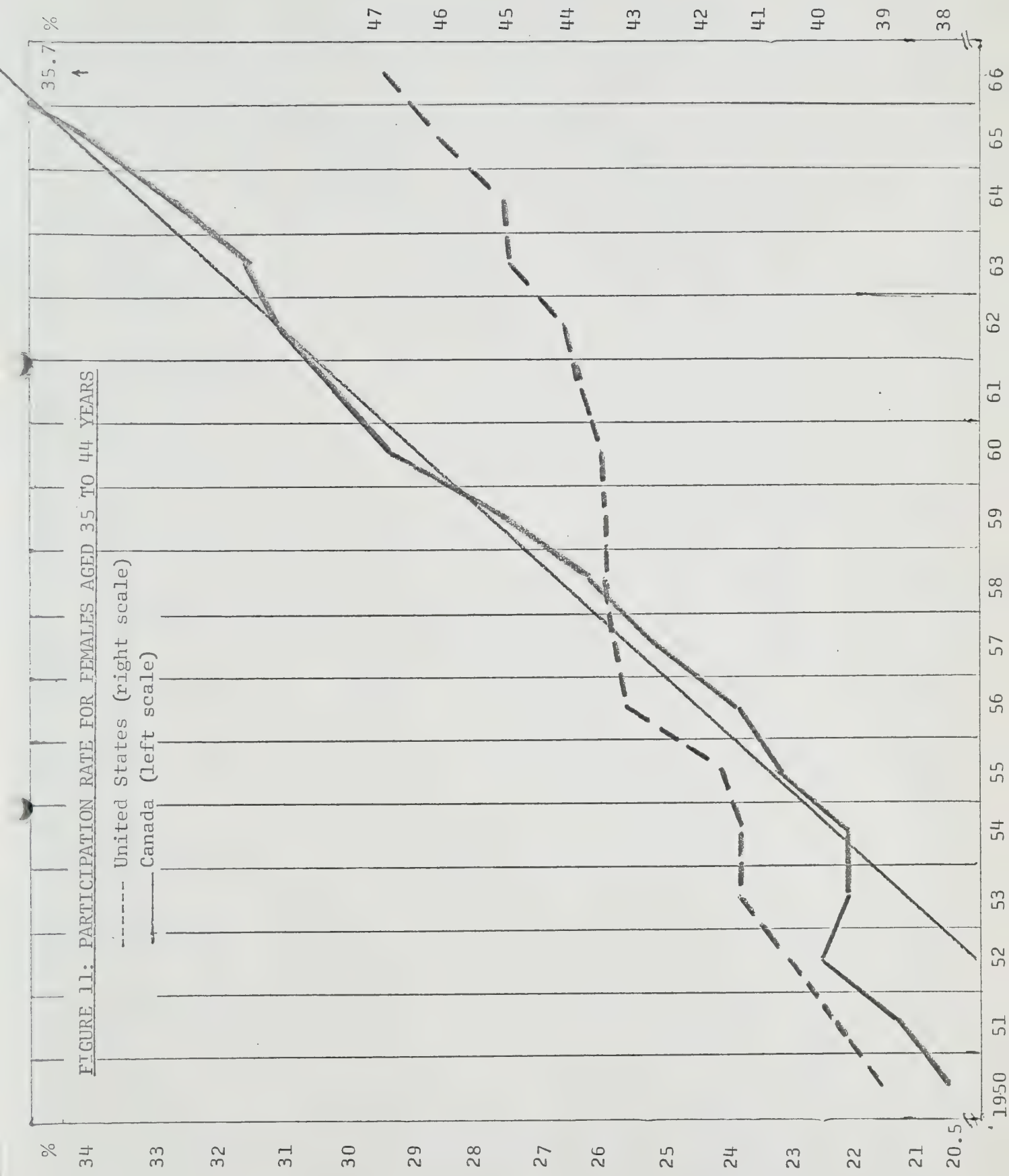


FIGURE 10: PARTICIPATION RATE FOR FEMALES AGED 25 TO 34 YEARS

----- United States (right scale)
 _____ Canada (left scale)

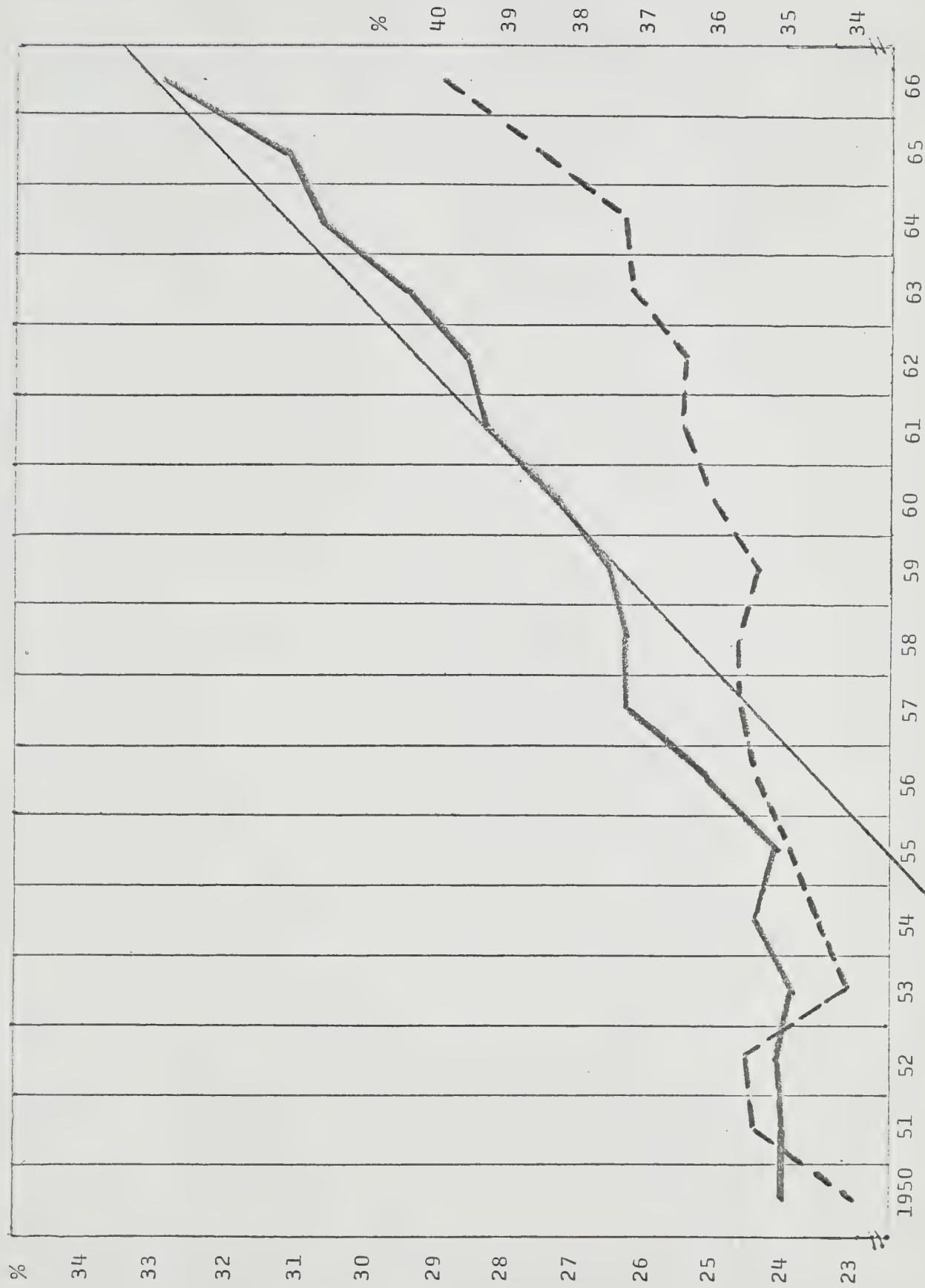


FIGURE 9: PARTICIPATION RATE FOR FEMALES AGED 20 TO 64 YEARS

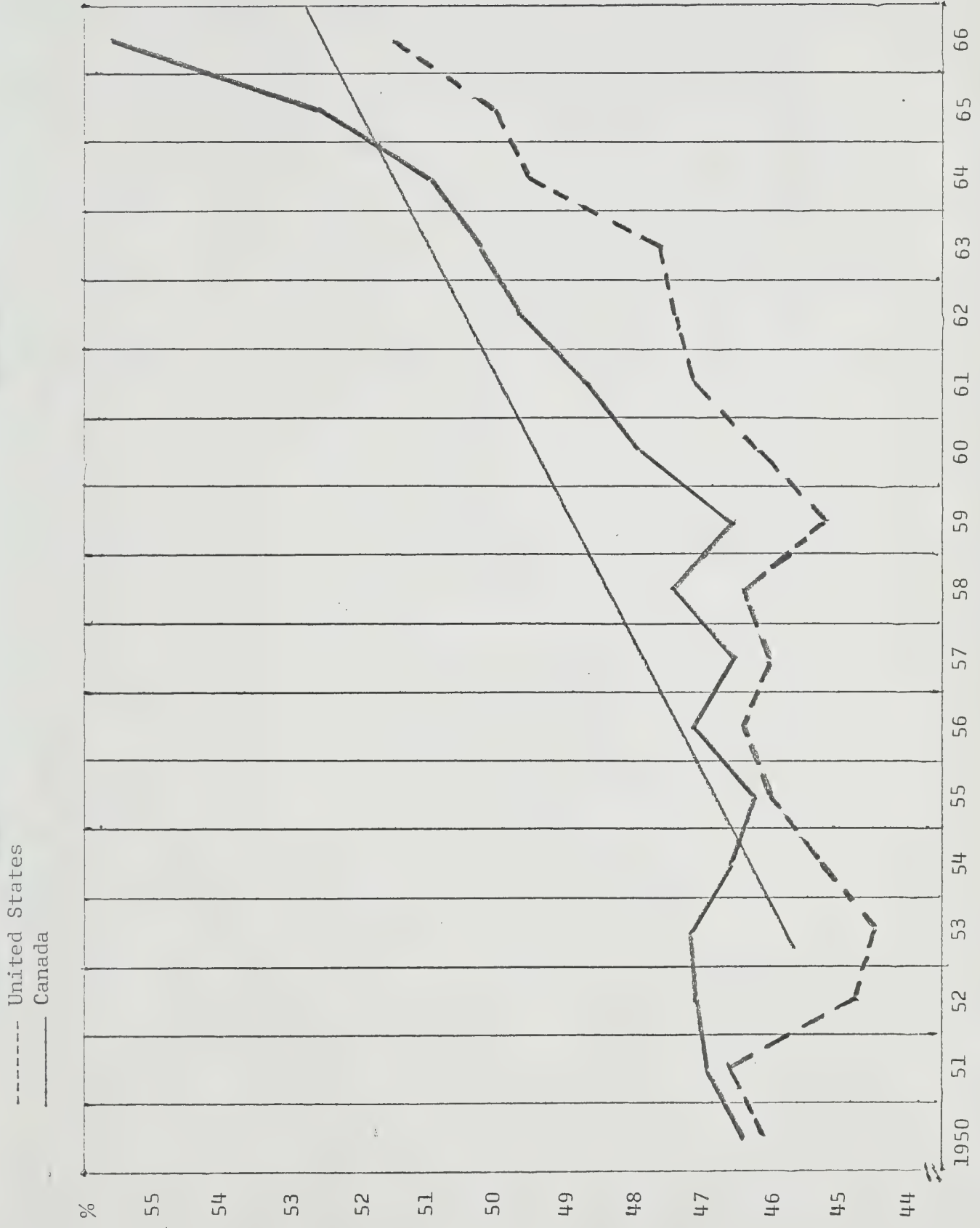


FIGURE 8: PARTICIPATION RATE FOR FEMALE'S AGED 14 TO 19 YEARS

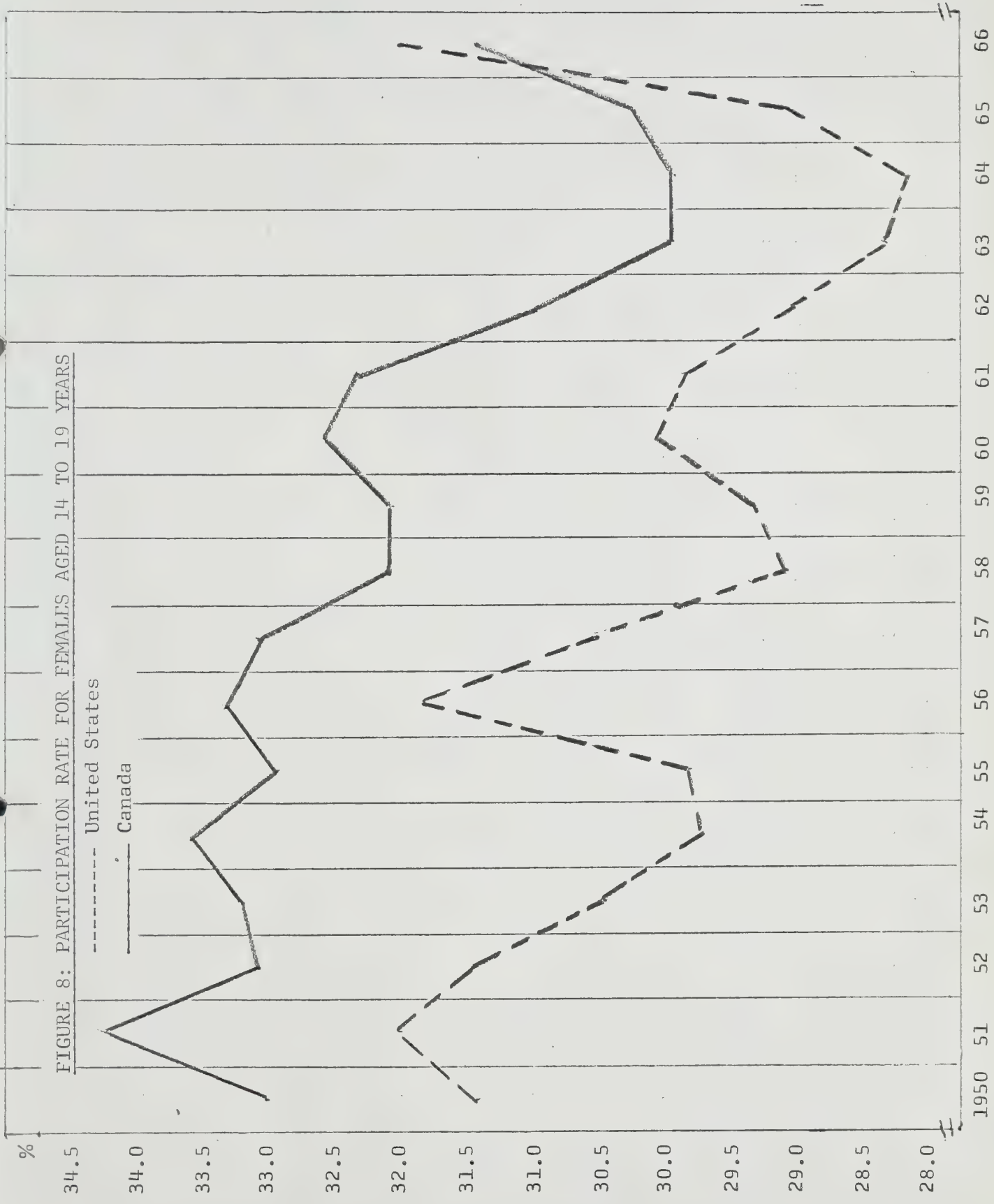


FIGURE 7: TOTAL FEMALE LABOUR FORCE PARTICIPATION RATE

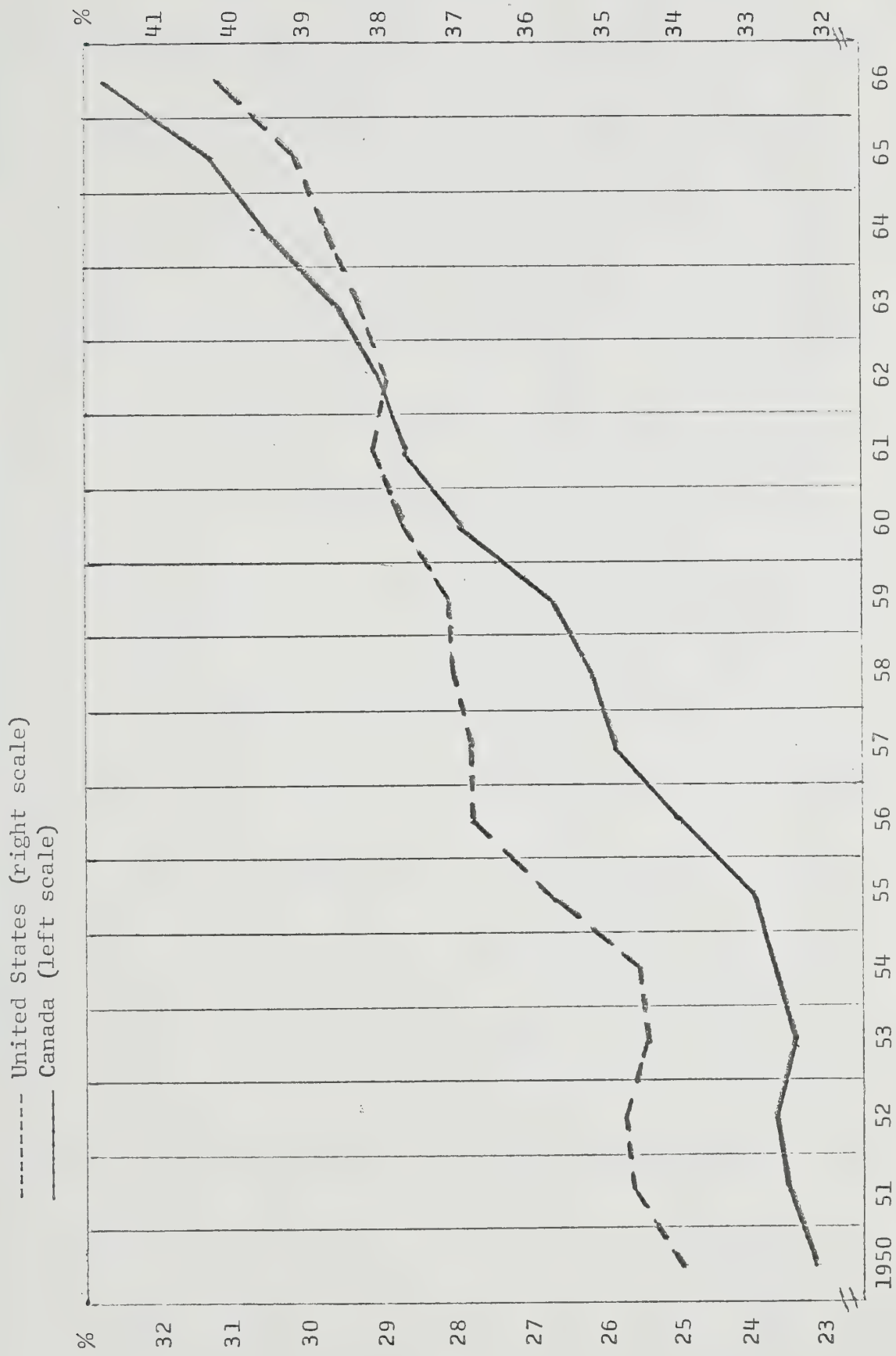
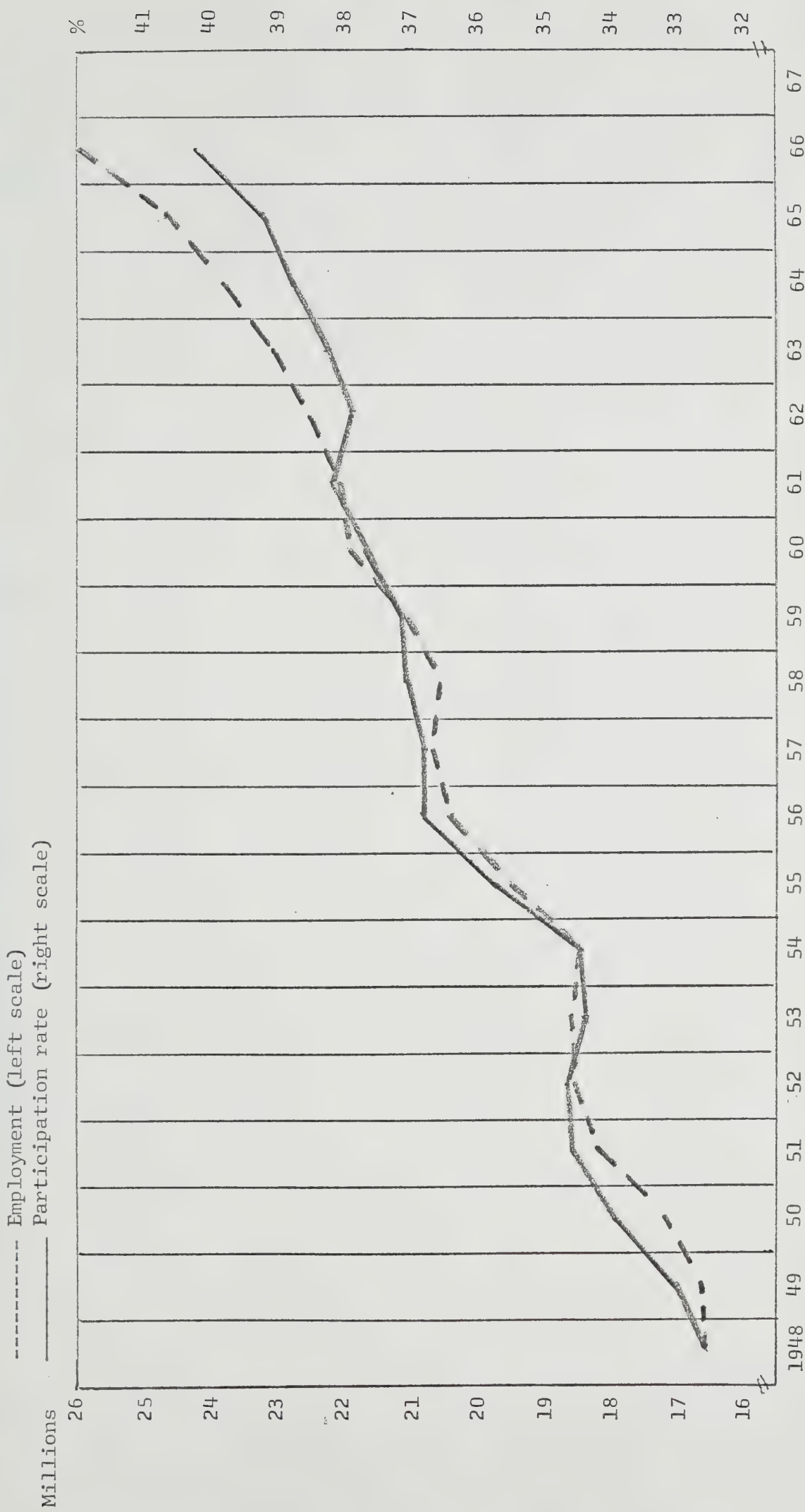




FIGURE 6: TOTAL FEMALE EMPLOYMENT AND PARTICIPATION RATE, UNITED STATES



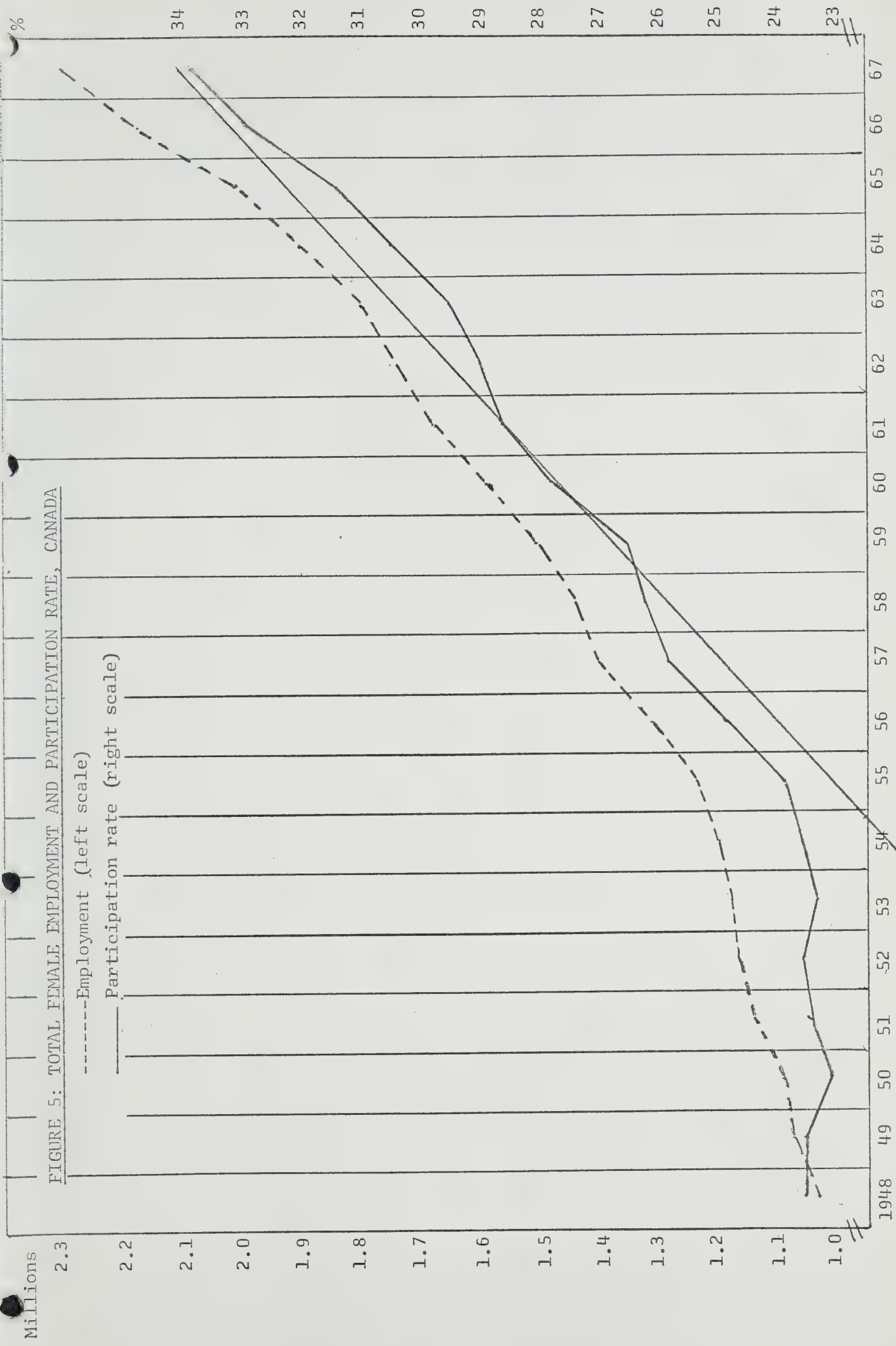


FIGURE 5: TOTAL FEMALE EMPLOYMENT AND PARTICIPATION RATE, CANADA



FIGURE 4: UNEMPLOYMENT RATE, UNITED STATES

----- Females
_____ Males

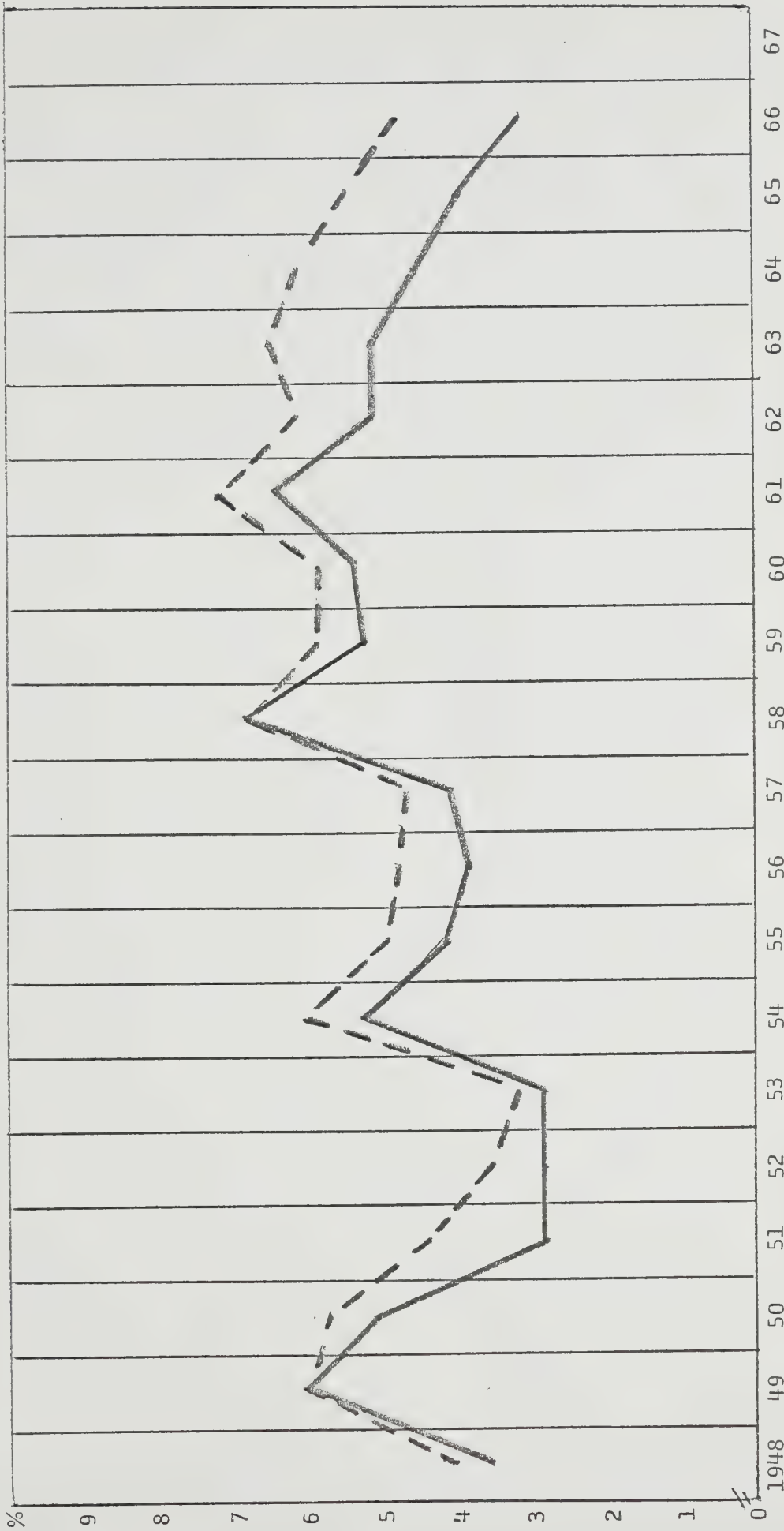
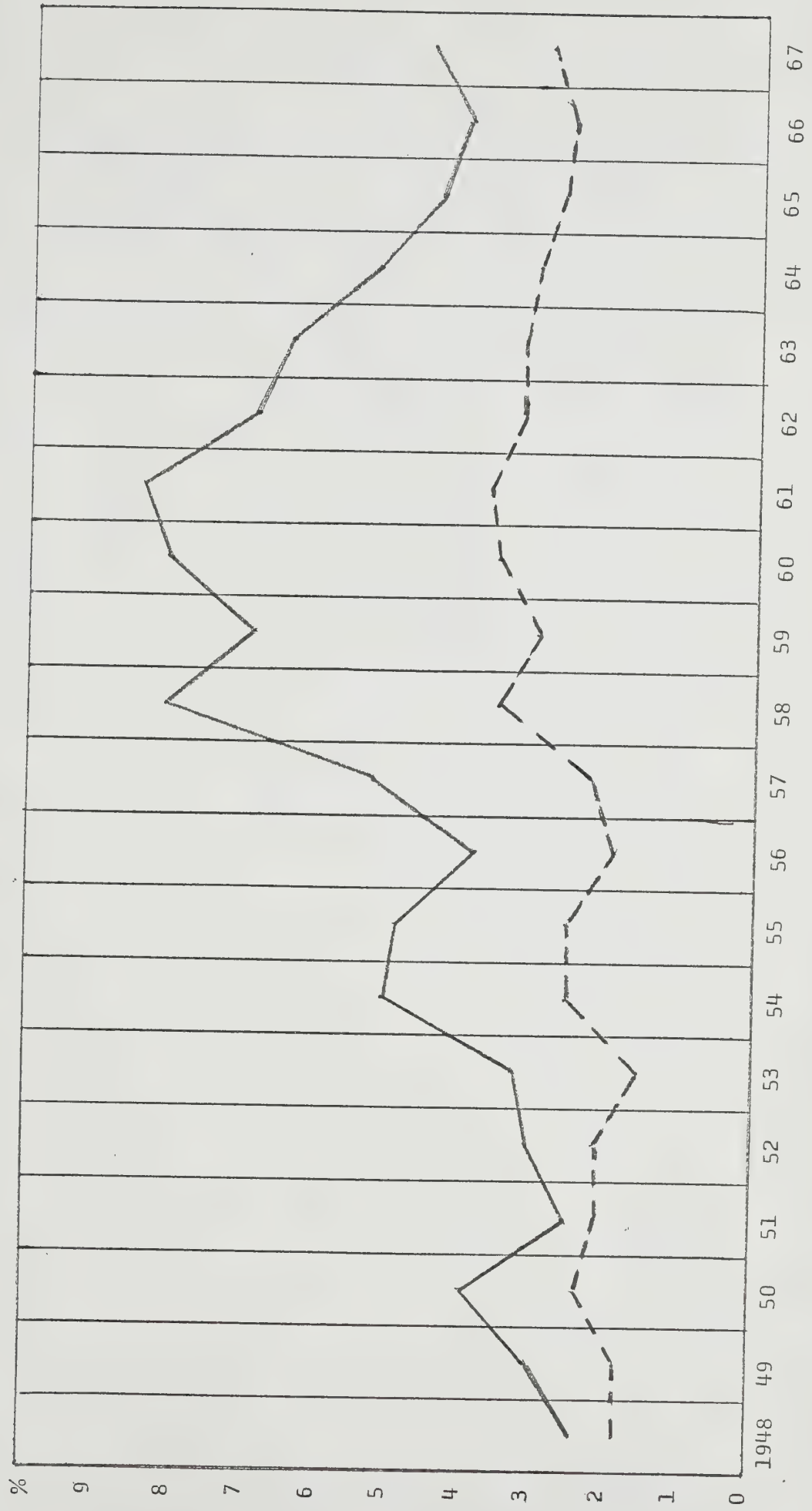
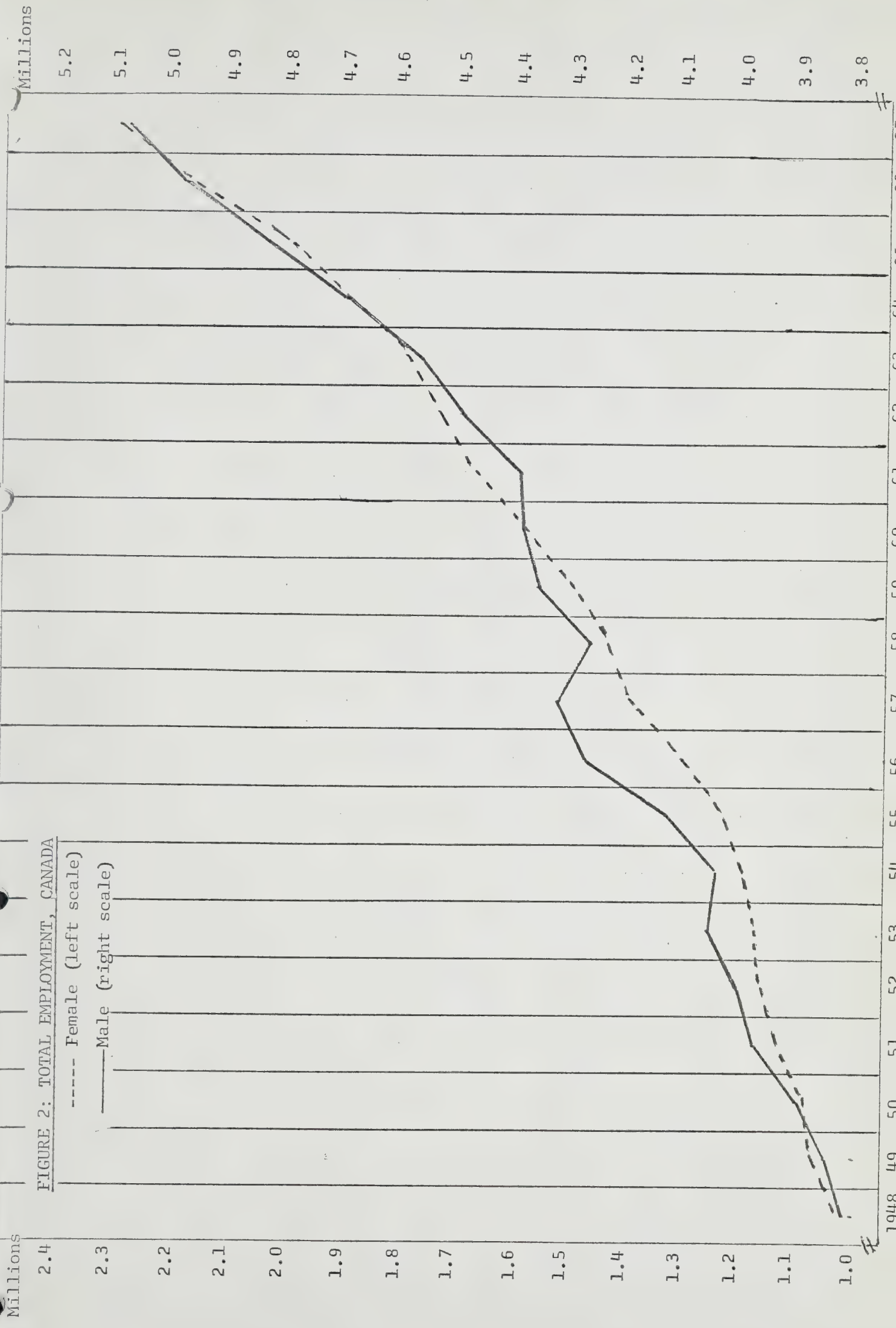


FIGURE 3: UNEMPLOYMENT RATE, CANADA

----- Females
—— Males





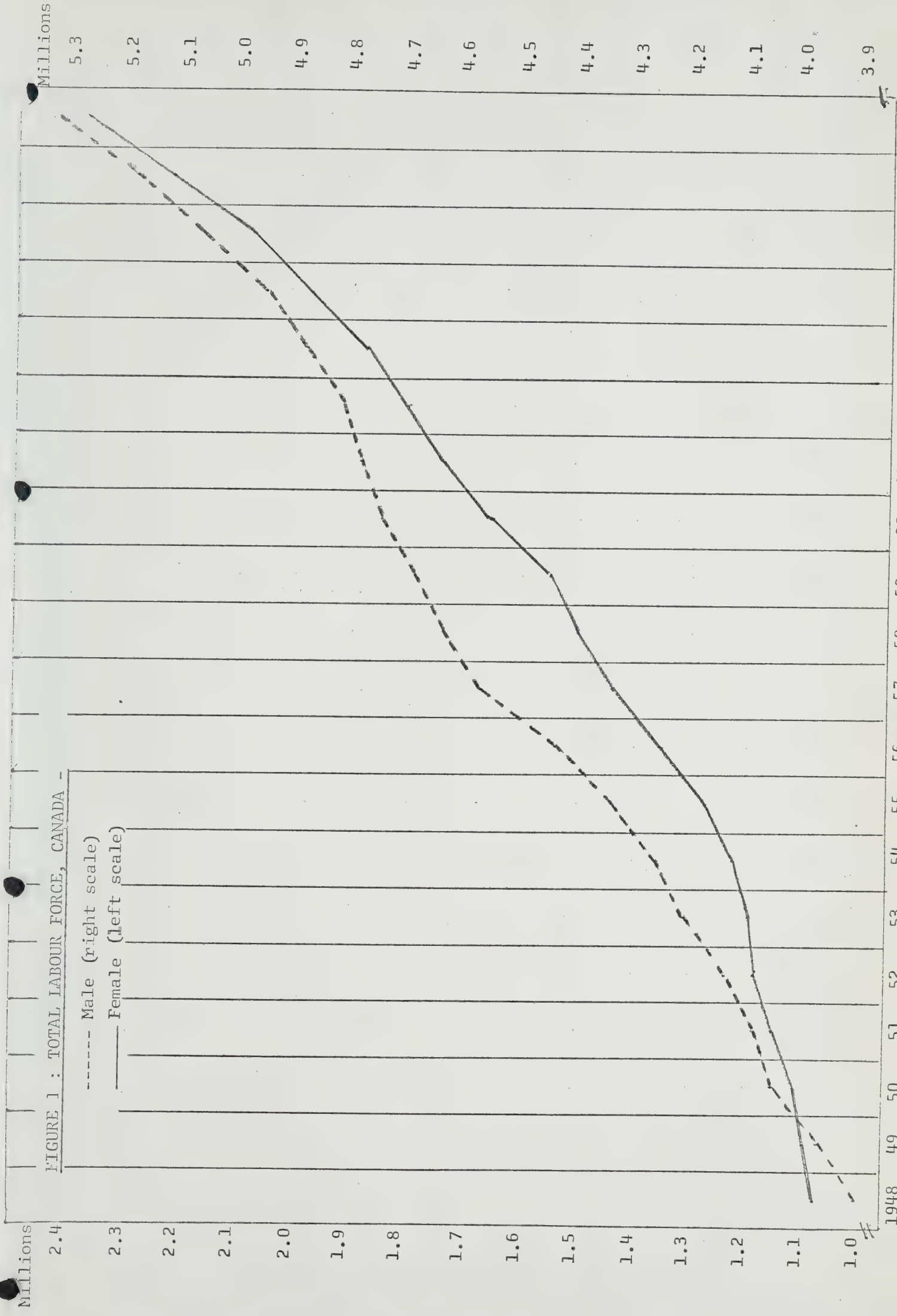


FIGURE 16: PARTICIPATION RATE FOR FEMALES AGED 65 YEARS AND OVER

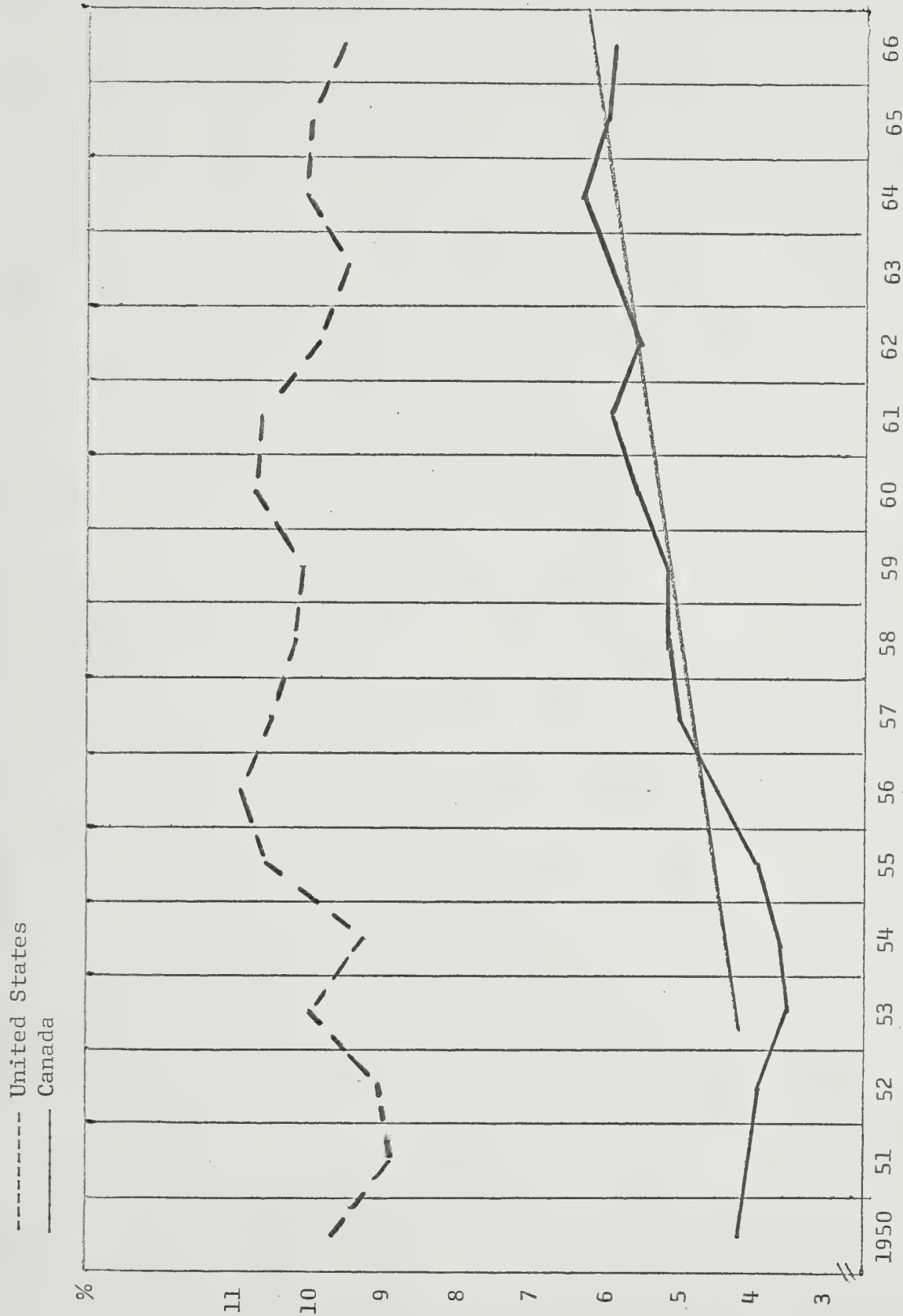
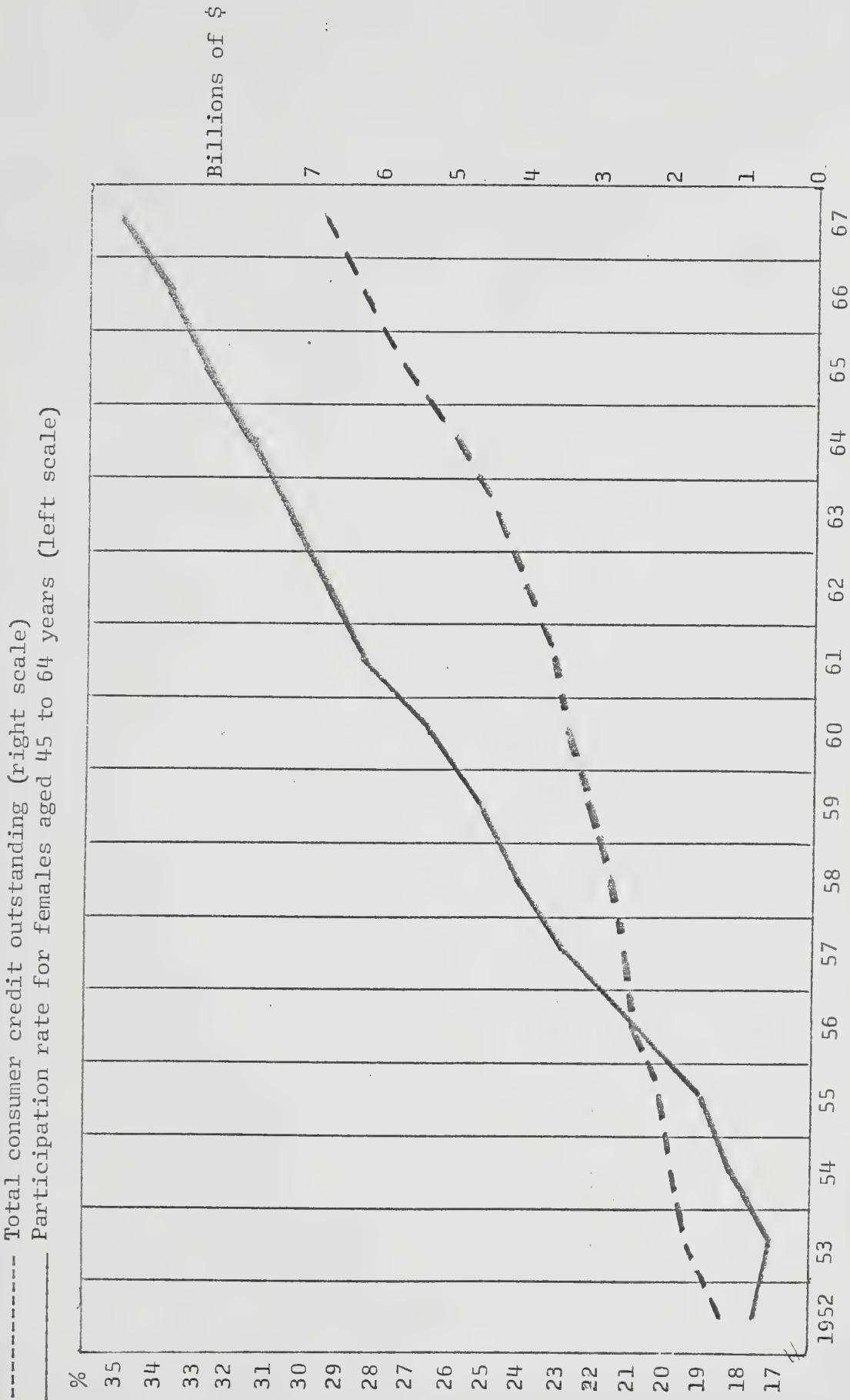
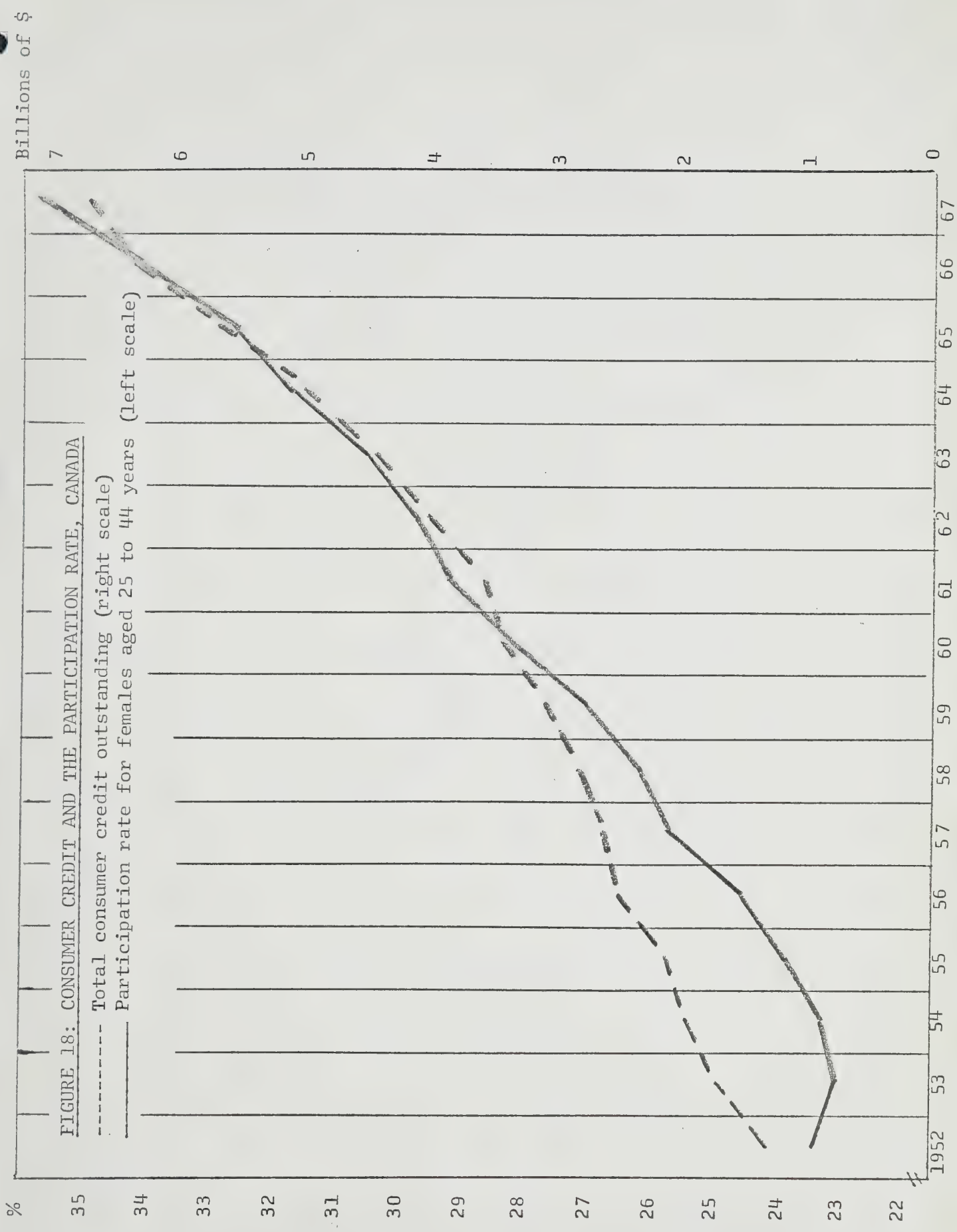
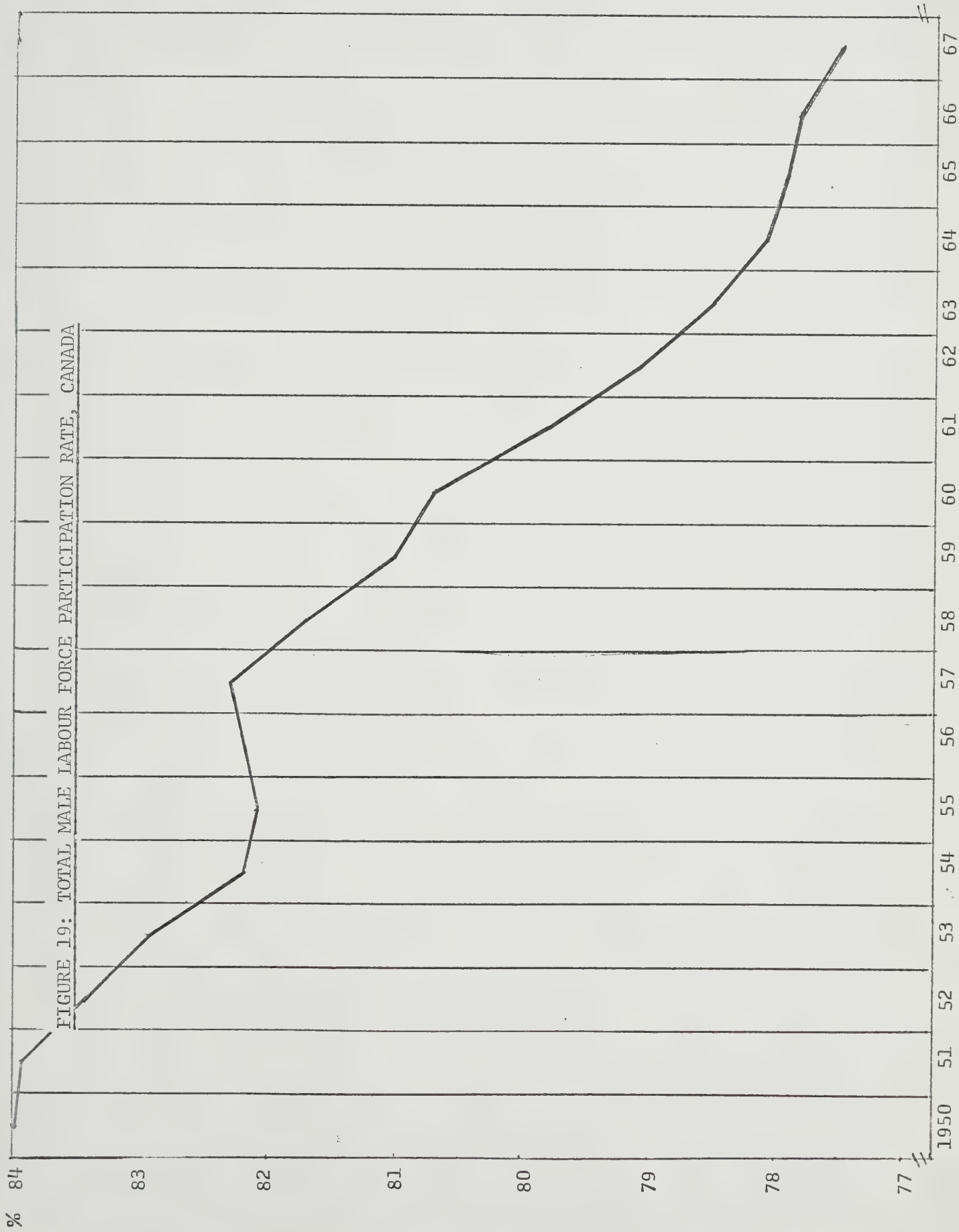
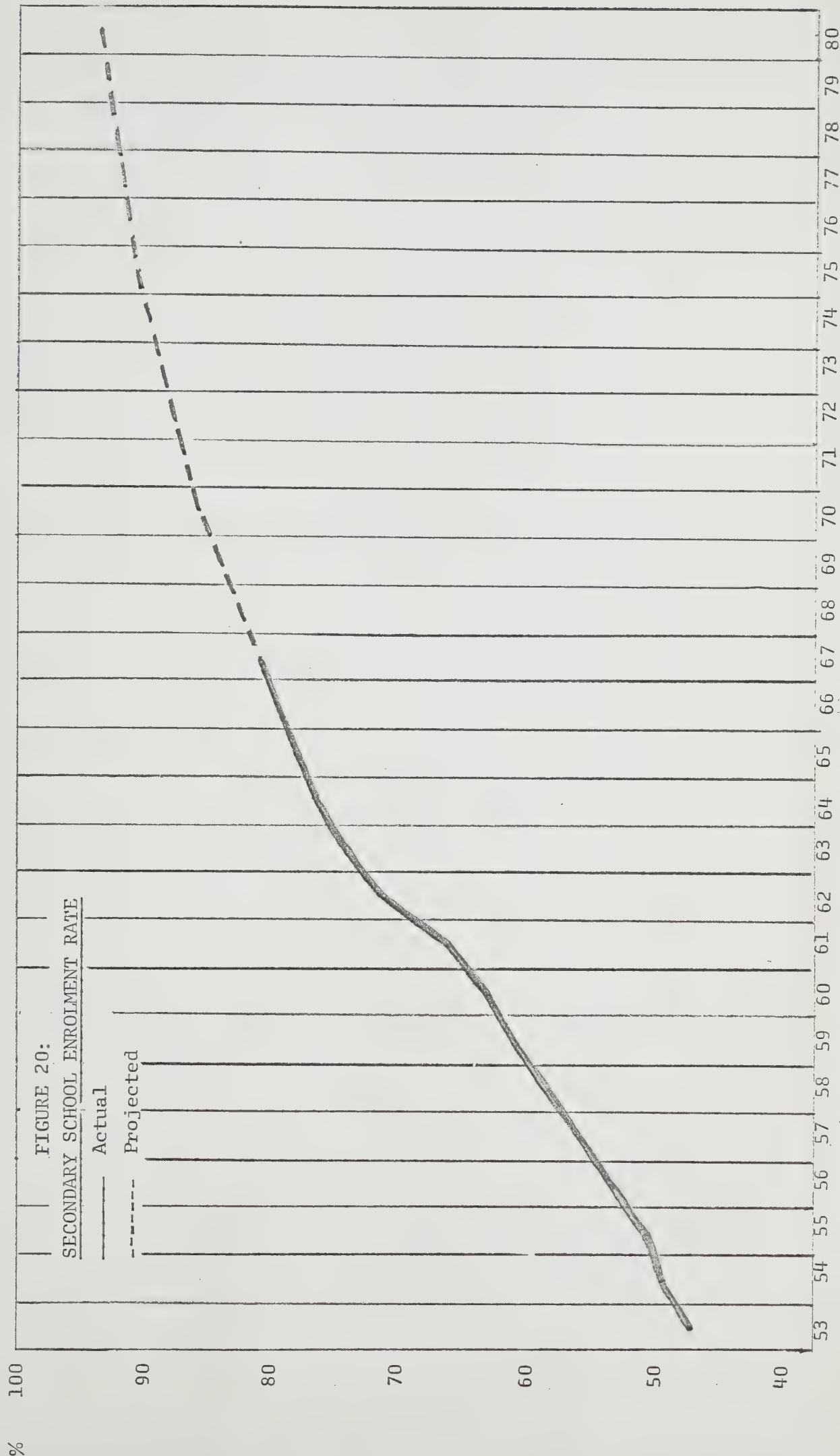


FIGURE 17: CONSUMER CREDIT AND THE PARTICIPATION RATE, CANADA



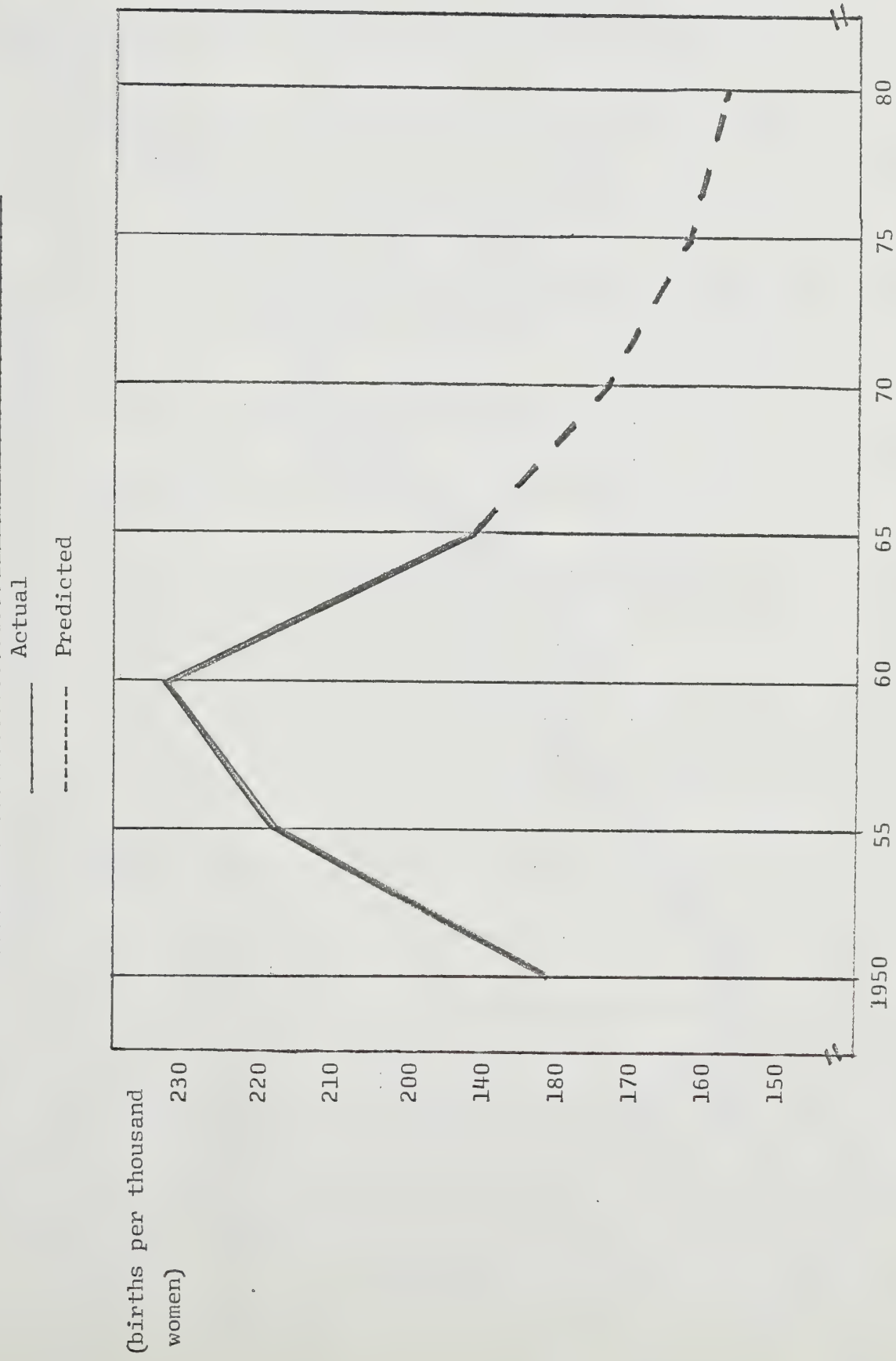






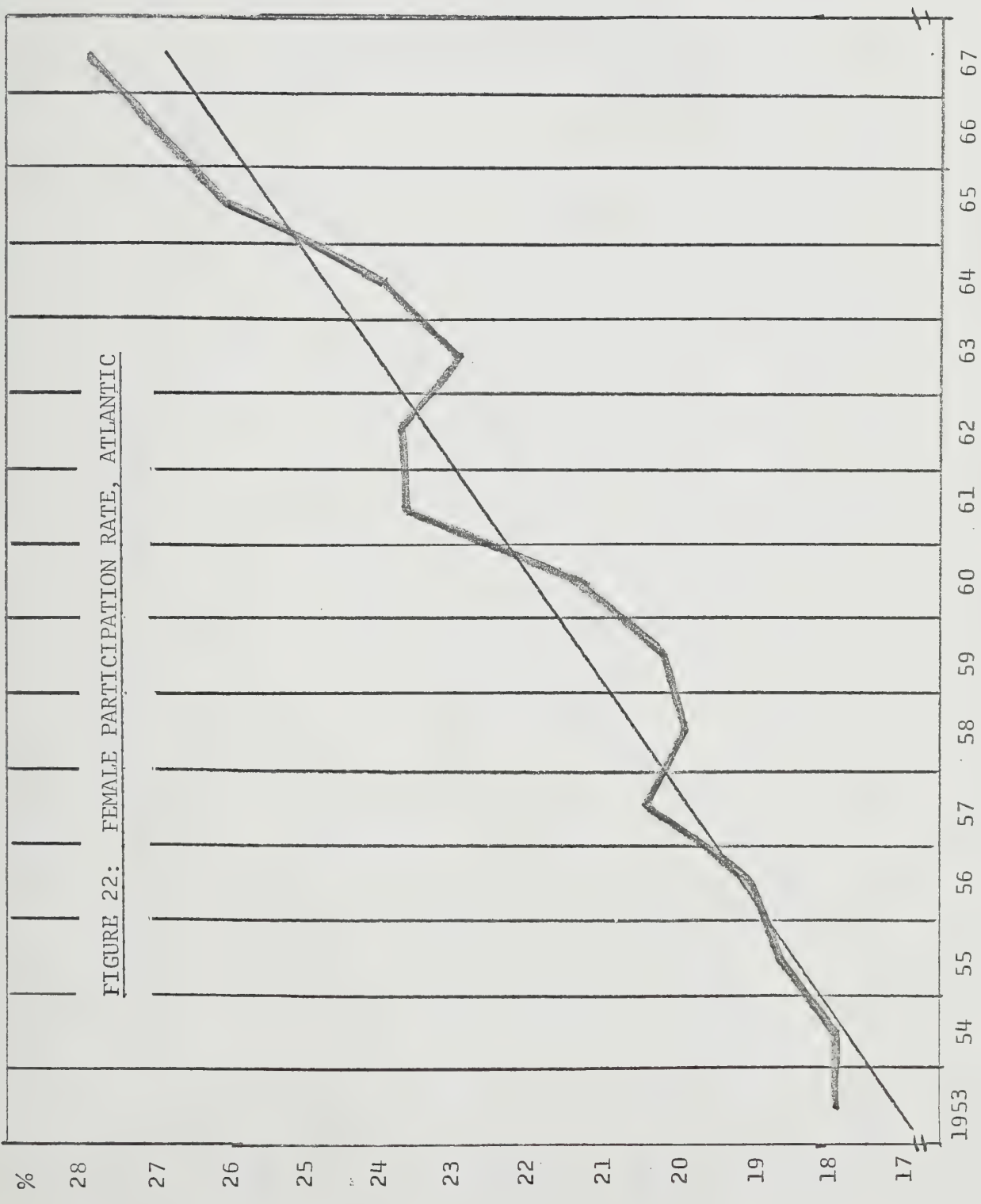
Source: Economic Council of Canada, Staff Study No. 20

FIGURE 21: FERTILITY RATE FOR WOMEN AGED 20 TO 24 YEARS



Source: Economic Council of Canada, Staff Study No. 19

FIGURE 22: FEMALE PARTICIPATION RATE, ATLANTIC



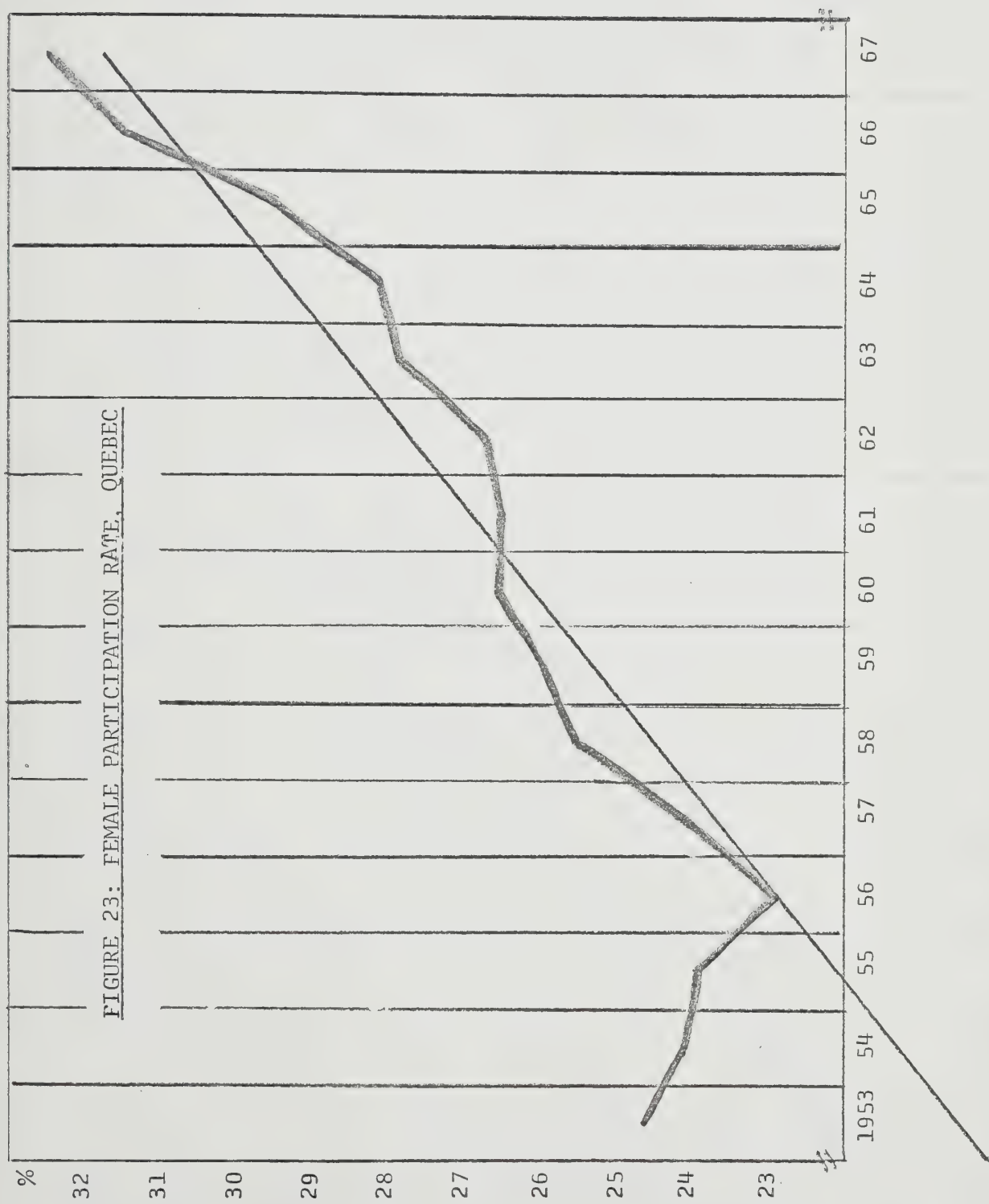


FIGURE 24: FEMALE PARTICIPATION RATE, ONTARIO

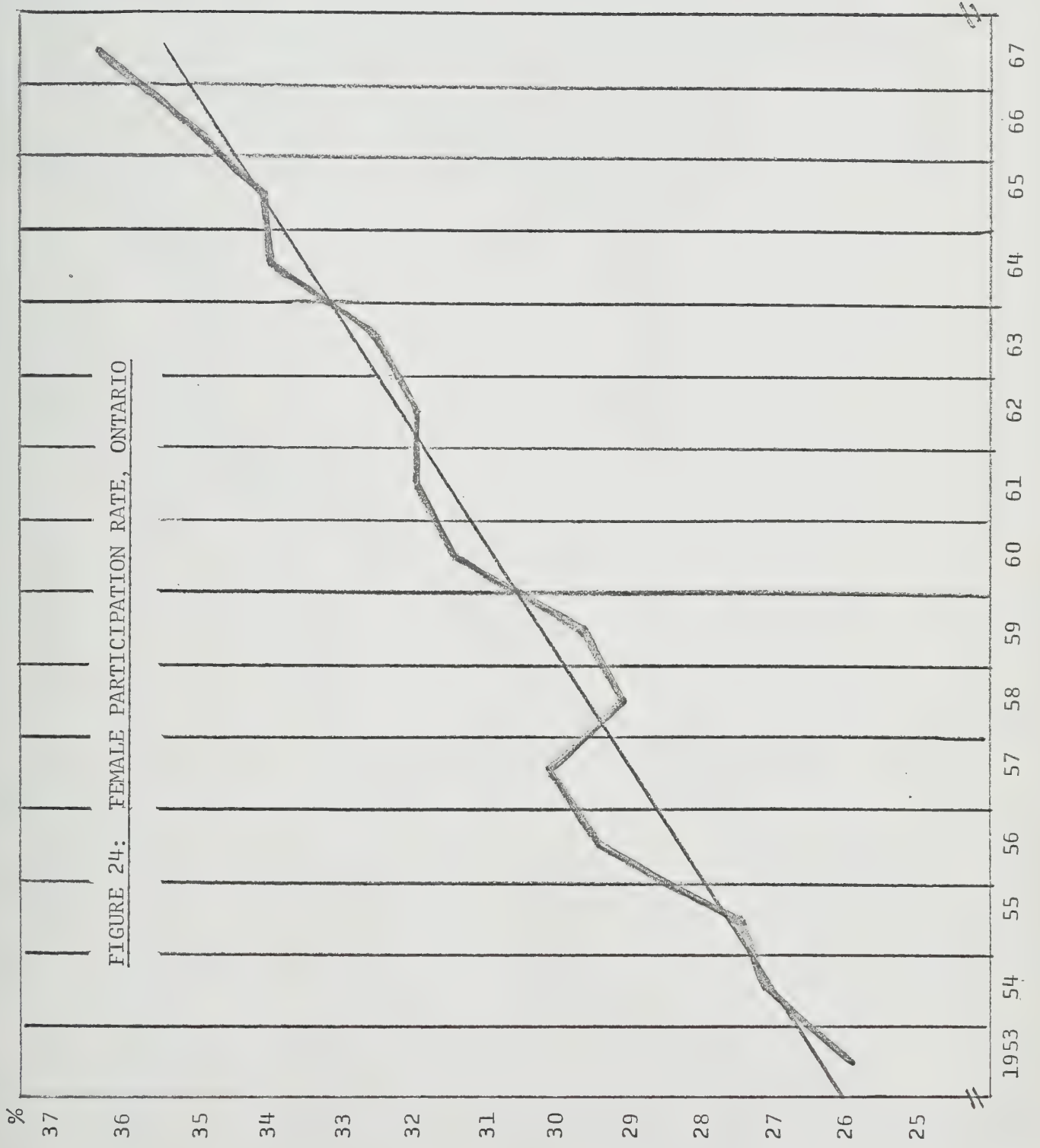


FIGURE 25: FEMALE PARTICIPATION RATE, PRAIRIES

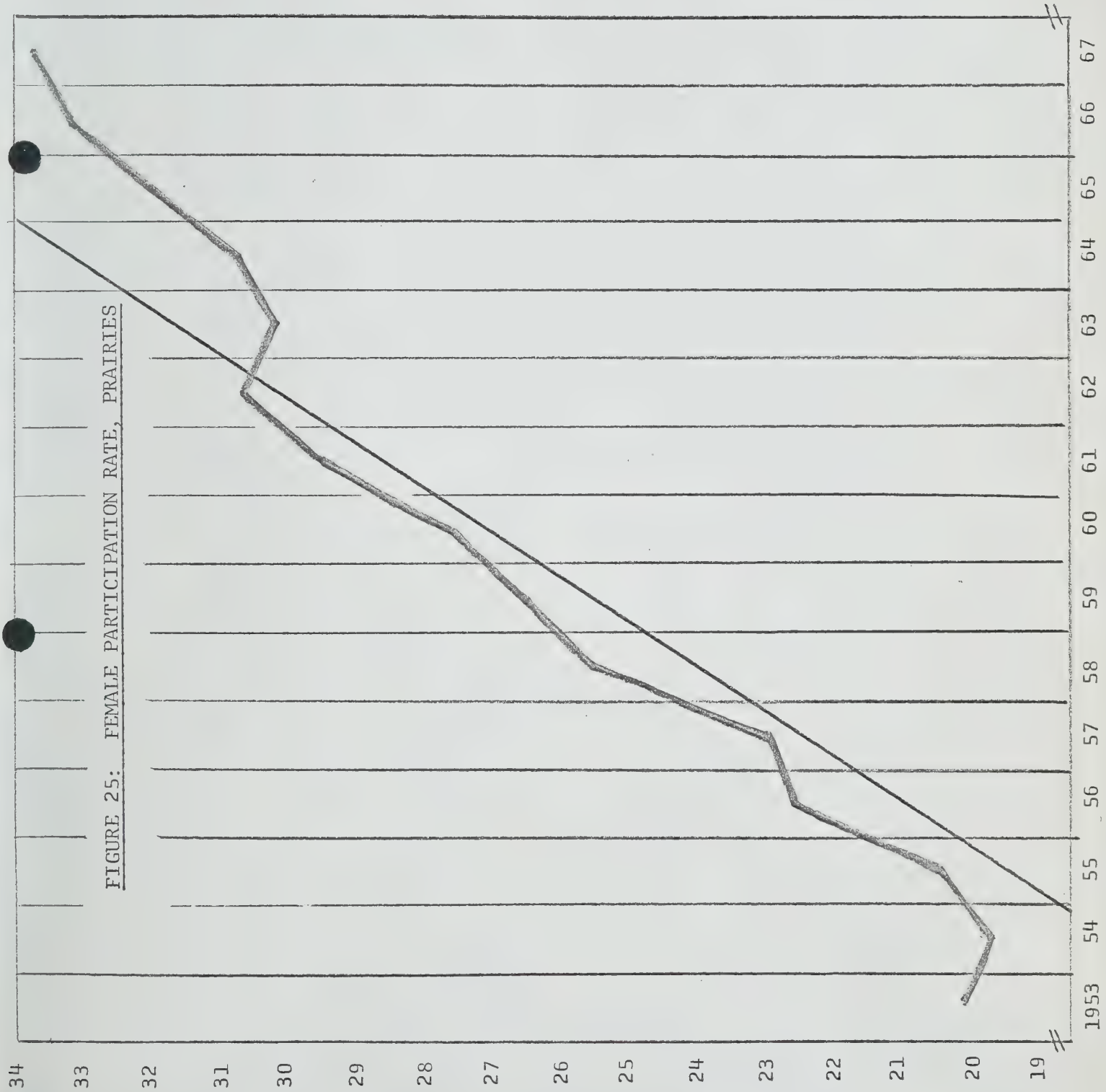


FIGURE 26: FEMALE PARTICIPATION RATE, BRITISH COLUMBIA

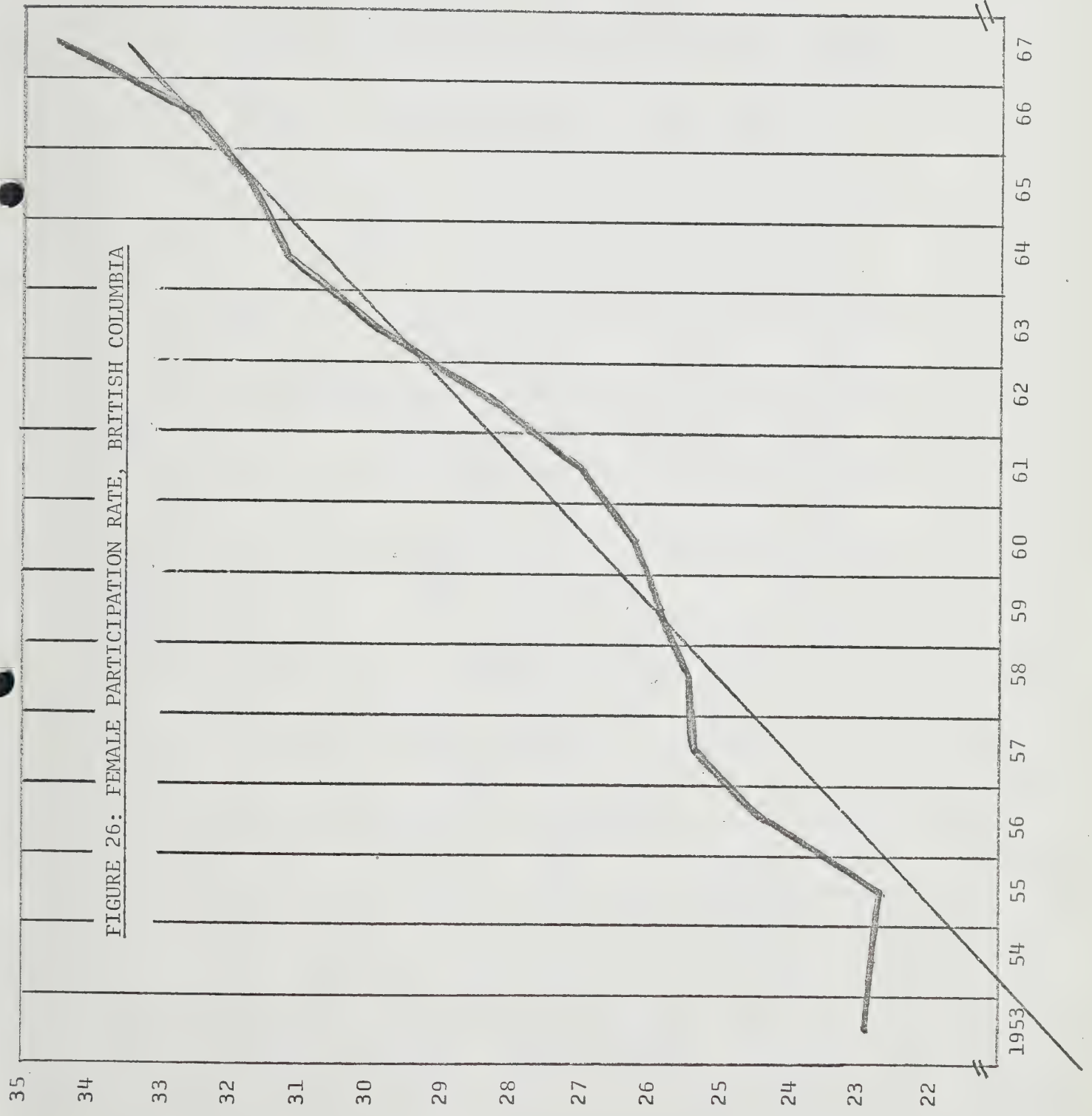


FIGURE 27: FEMALE EMPLOYMENT IN PUBLIC ADMINISTRATION AS A PERCENT
OF TOTAL FEMALE EMPLOYMENT

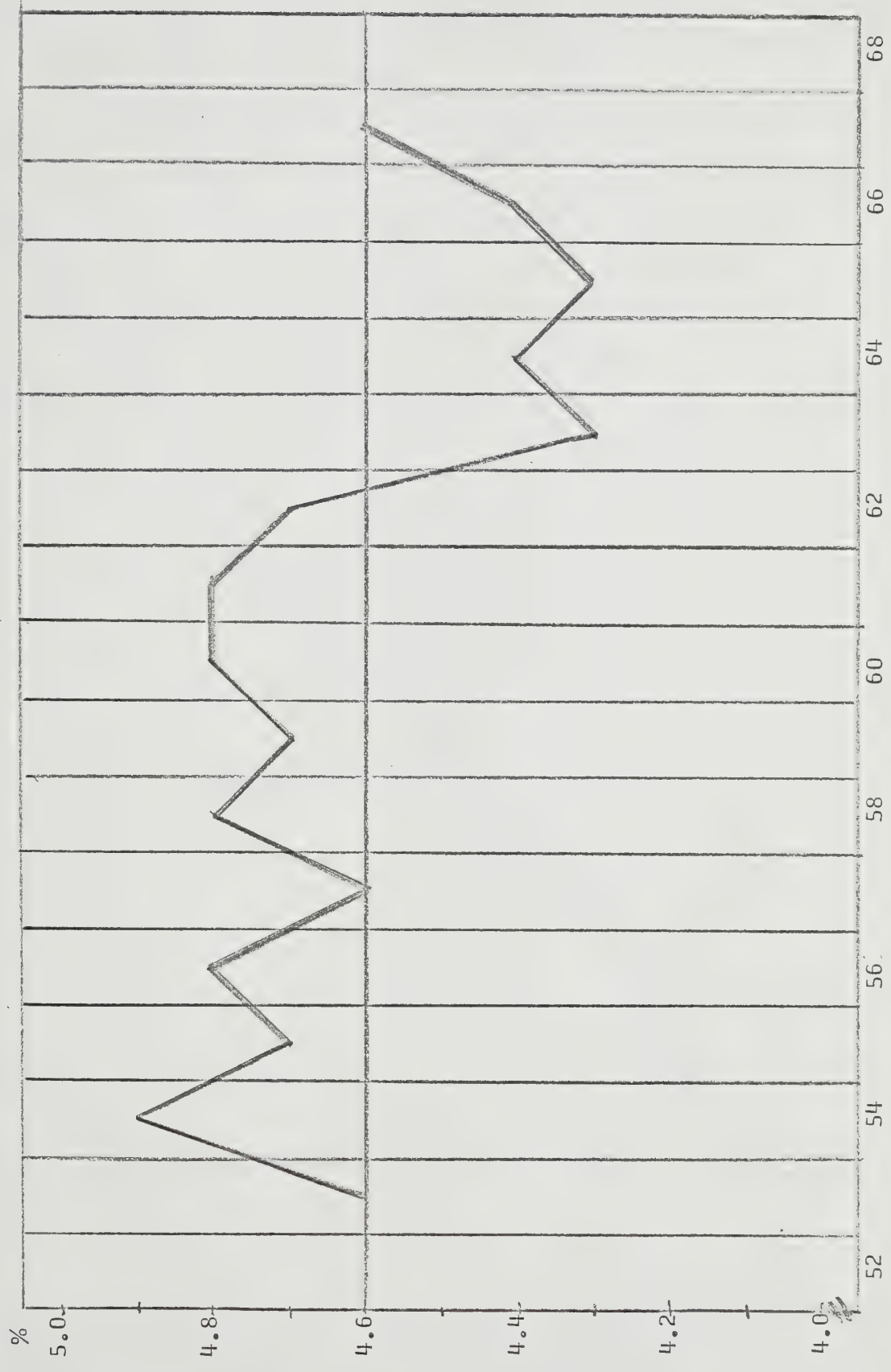


FIGURE 28: FEMALE EMPLOYMENT IN PERSONAL, RECREATIONAL, COMMUNITY
OR BUSINESS SERVICES AS A PERCENT OF TOTAL FEMALE EMPLOYMENT

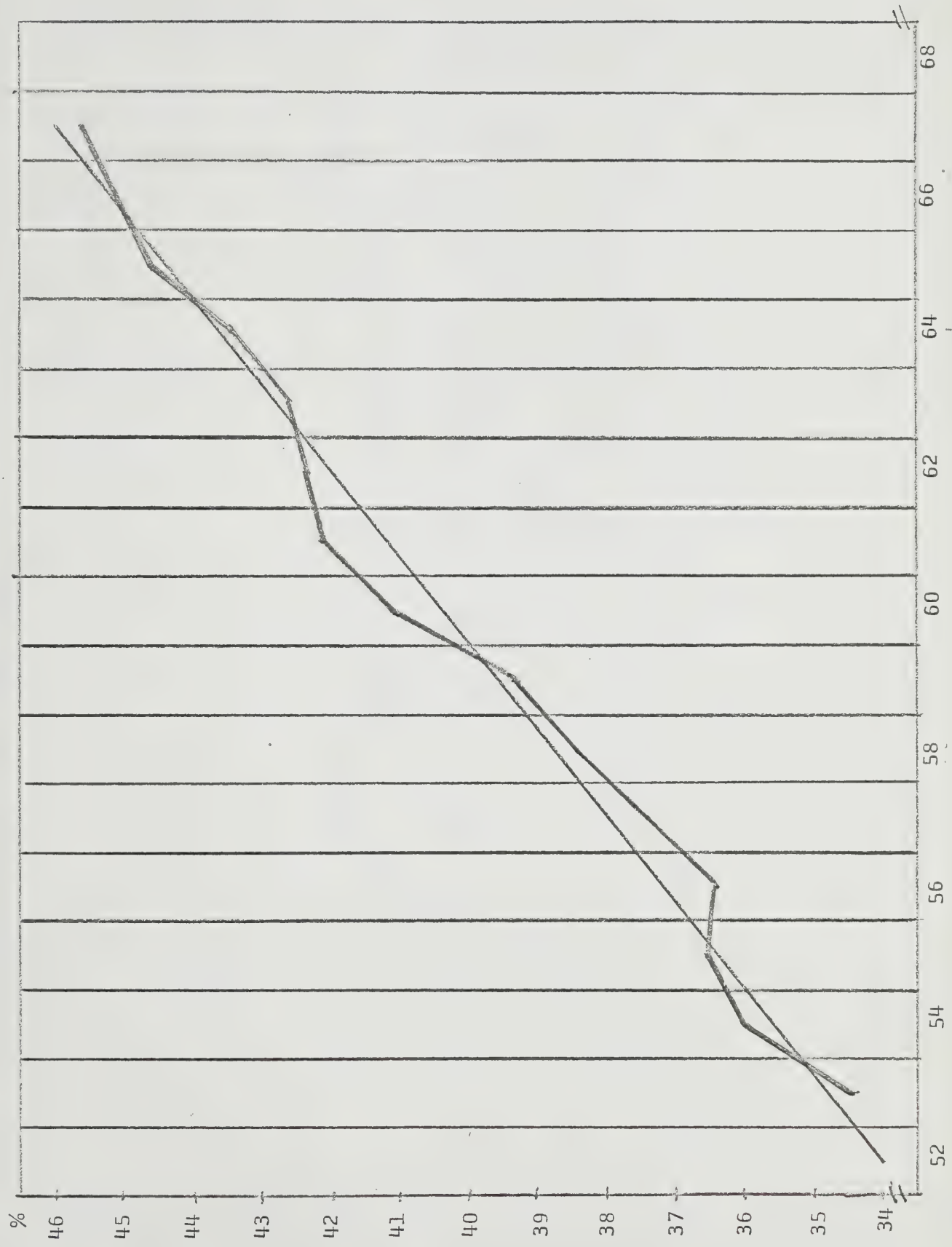


FIGURE 29: FEMALE EMPLOYMENT IN FINANCE (INCLUDING INSURANCE AND REAL ESTATE)
AS A PERCENT OF TOTAL FEMALE EMPLOYMENT

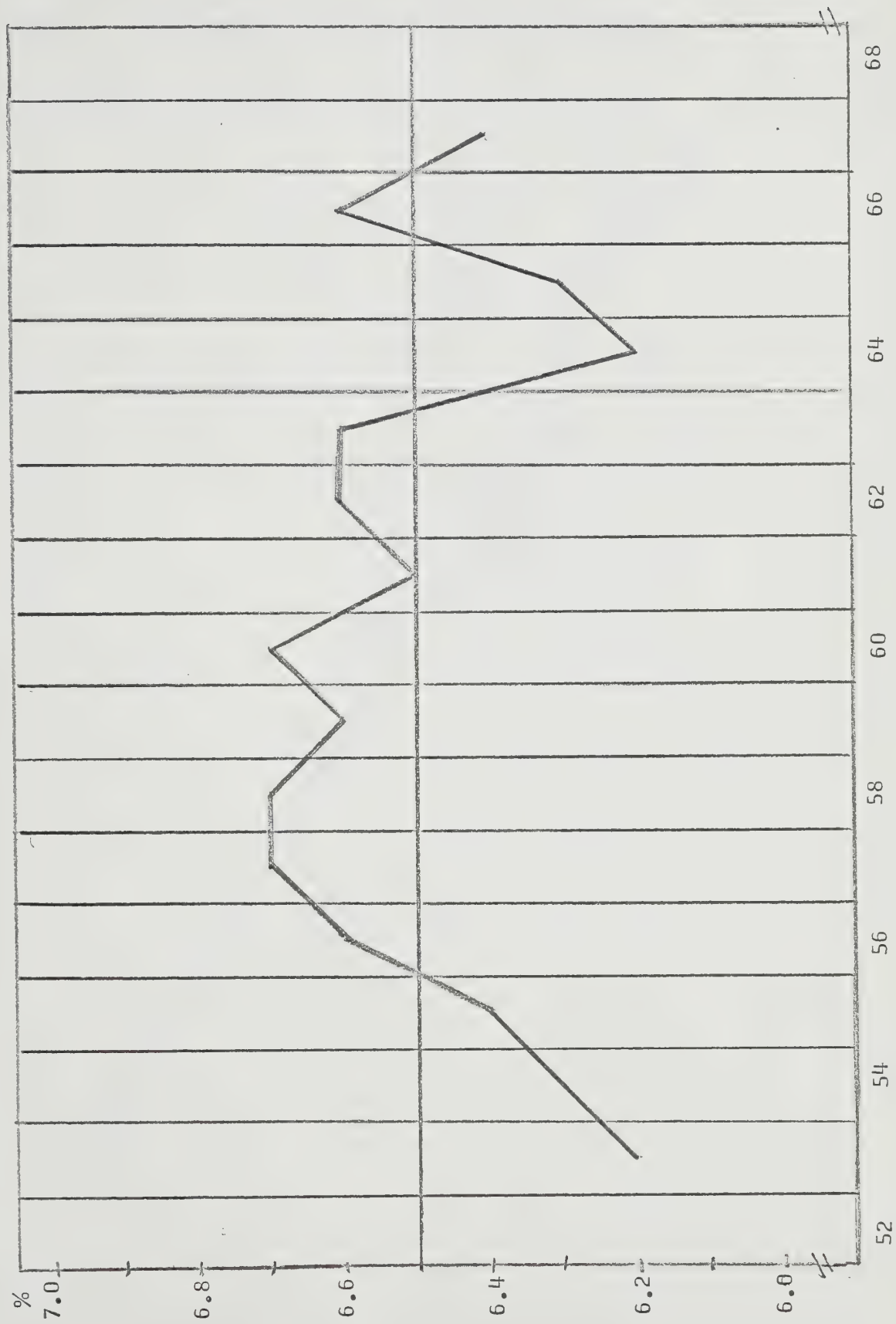


FIGURE 30: FEMALE EMPLOYMENT IN TRADE (RETAIL AND WHOLESALE) AS A PERCENT OF TOTAL FEMALE EMPLOYMENT

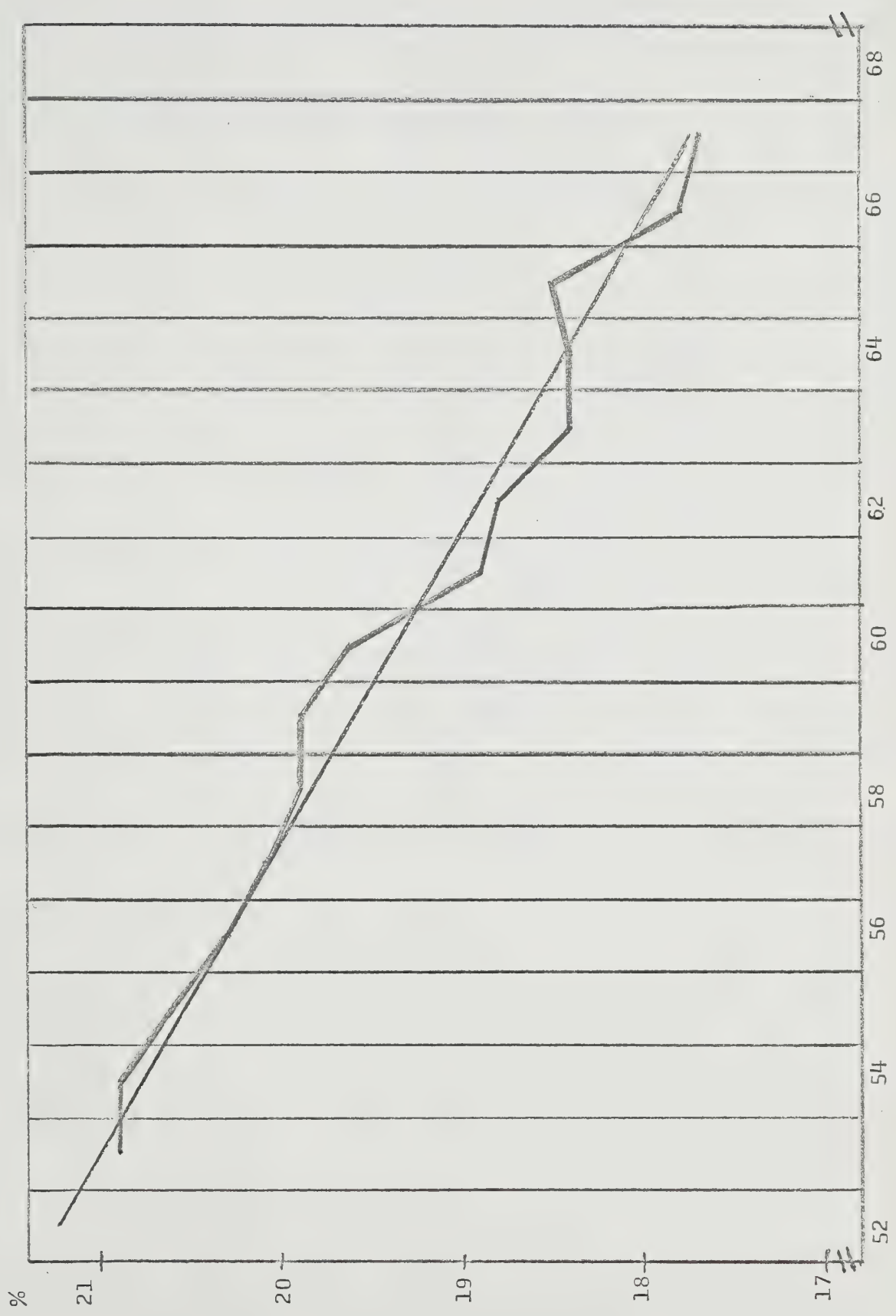


FIGURE 31: FEMALE EMPLOYMENT IN MANUFACTURING
AS A PERCENT OF TOTAL FEMALE EMPLOYMENT

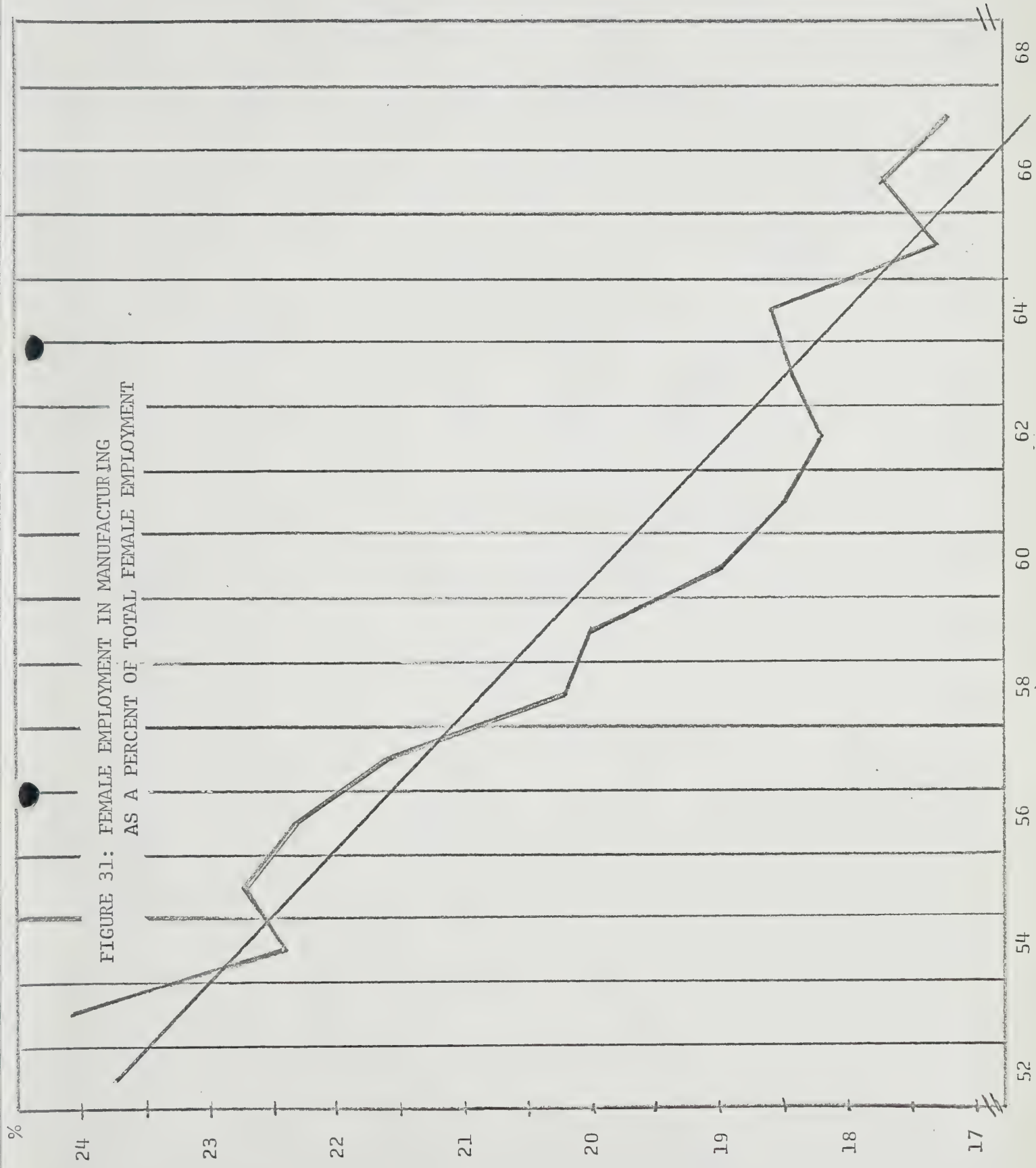


FIGURE 32: FEMALE EMPLOYMENT IN TRANSPORTATION AND COMMUNICATIONS
AS A PERCENT OF TOTAL FEMALE EMPLOYMENT

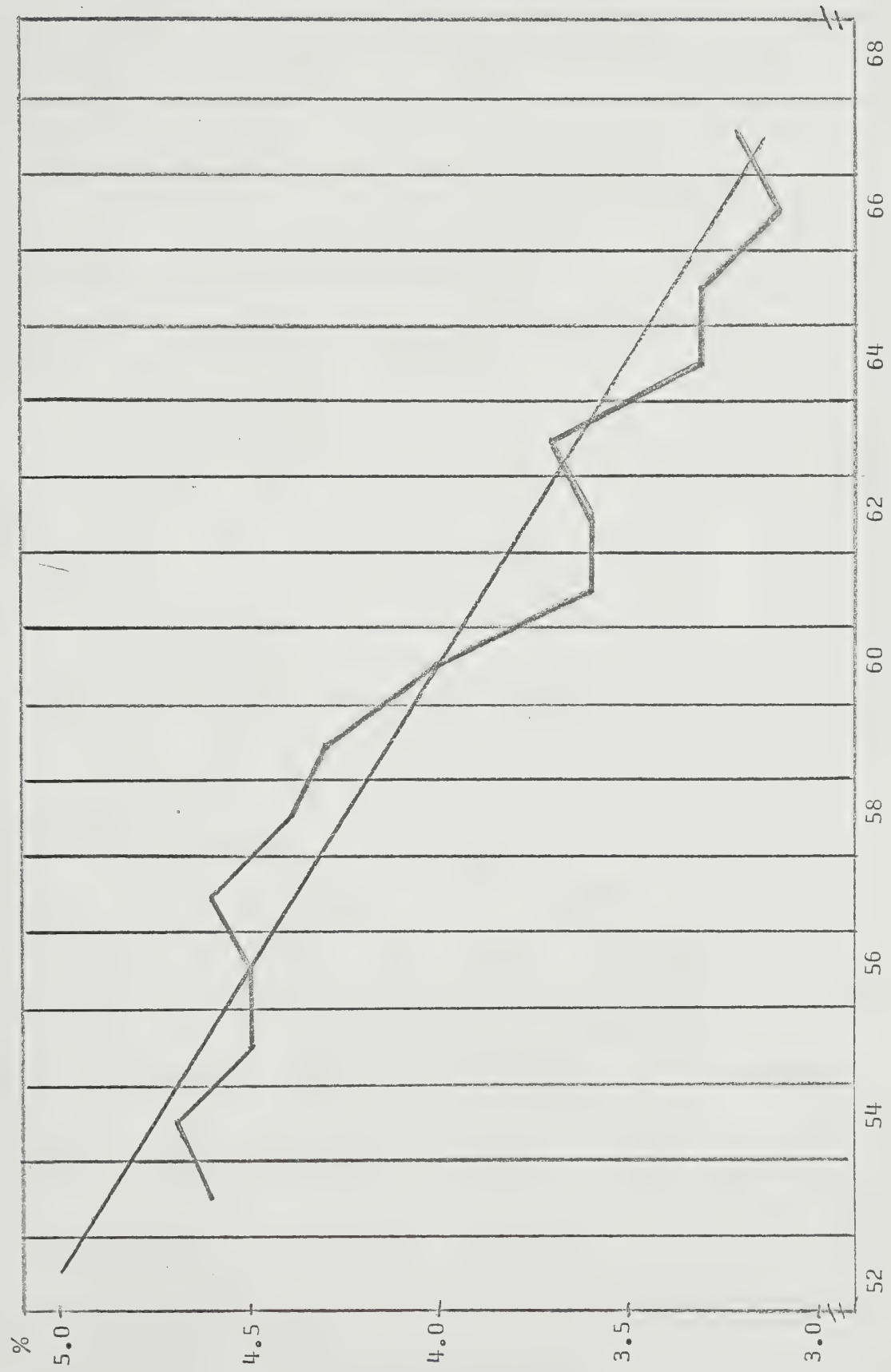


FIGURE 33: FEMALE EMPLOYMENT IN AGRICULTURE
AS A PERCENT OF TOTAL FEMALE EMPLOYMENT

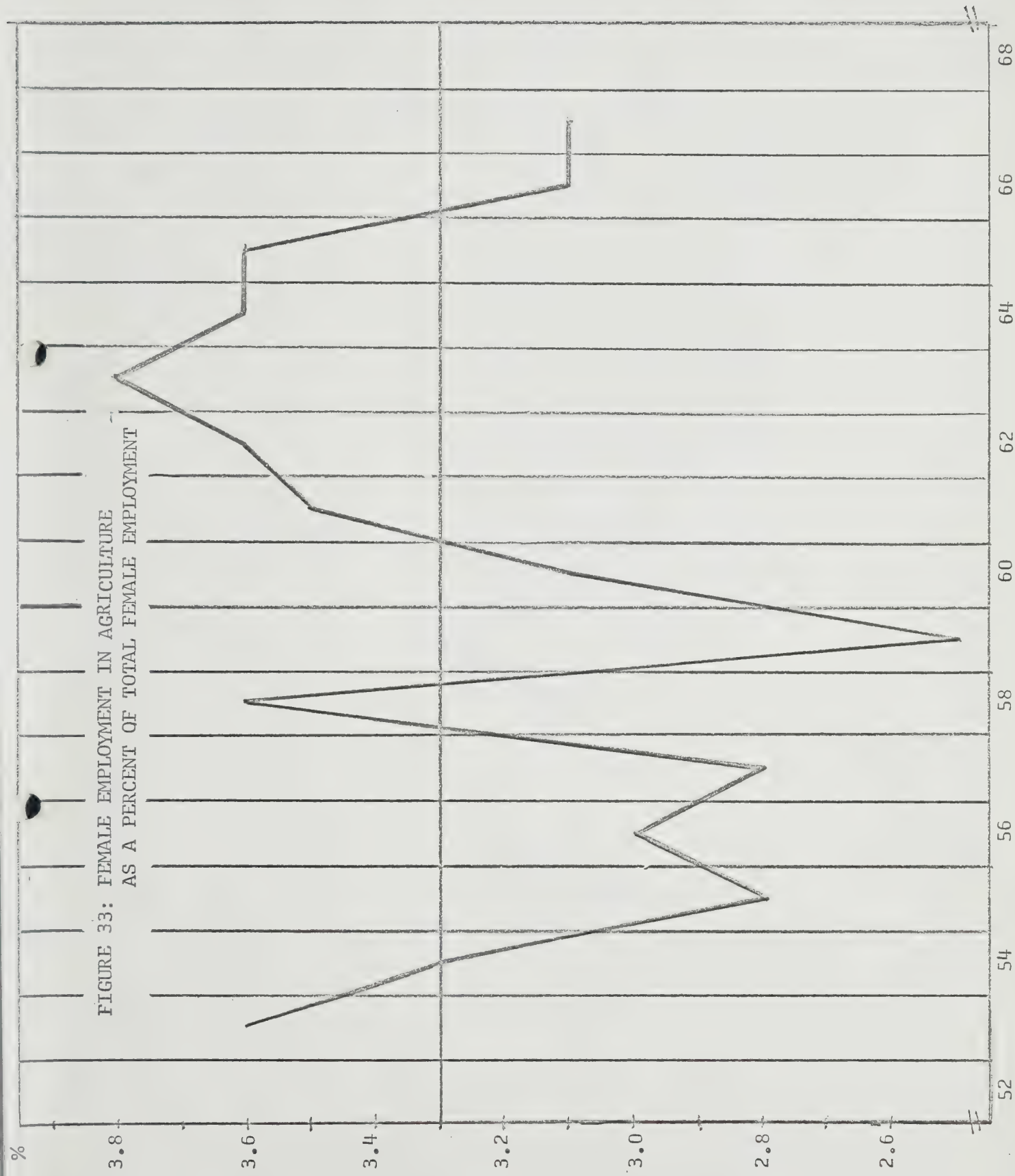


FIGURE 34: FEMALE EMPLOYMENT IN UNSPECIFIED
SECTORS AS A PERCENT OF TOTAL FEMALE EMPLOYMENT

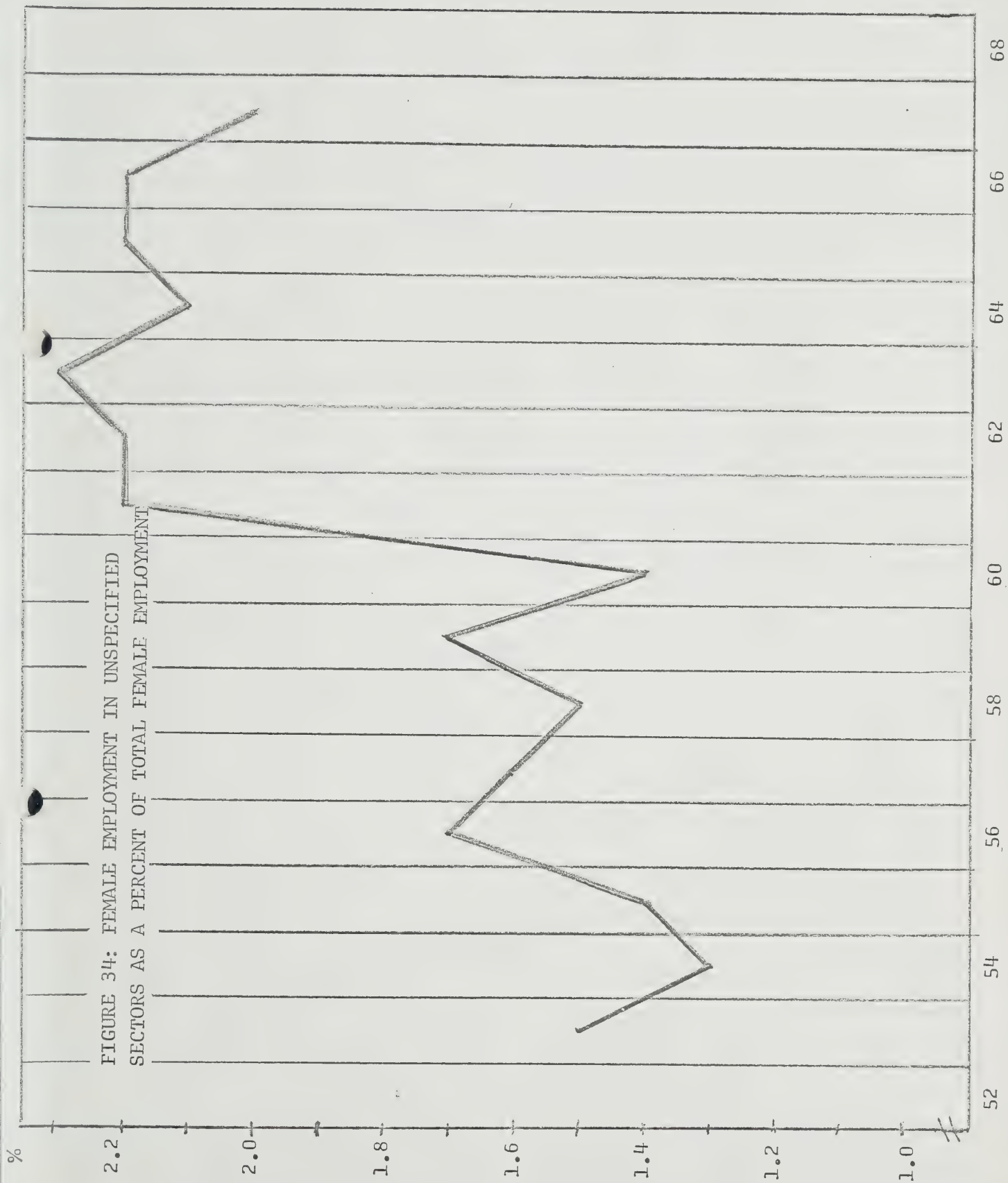


FIGURE 35: FEMALE FARM WORKERS AS A PERCENT OF
TOTAL FEMALE WORKERS

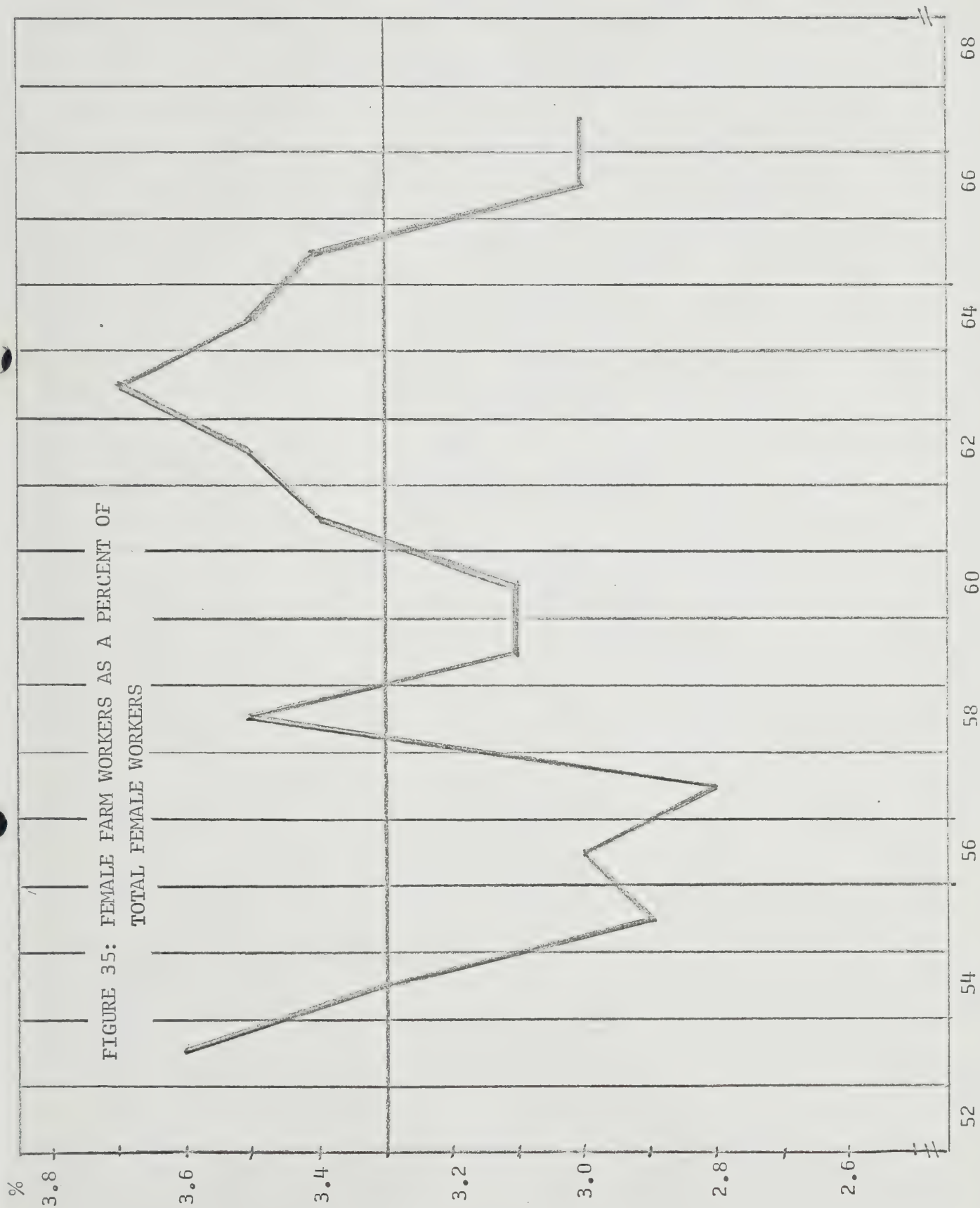


FIGURE 36: SALESWOMEN AS A PERCENT OF TOTAL FEMALE WORKERS

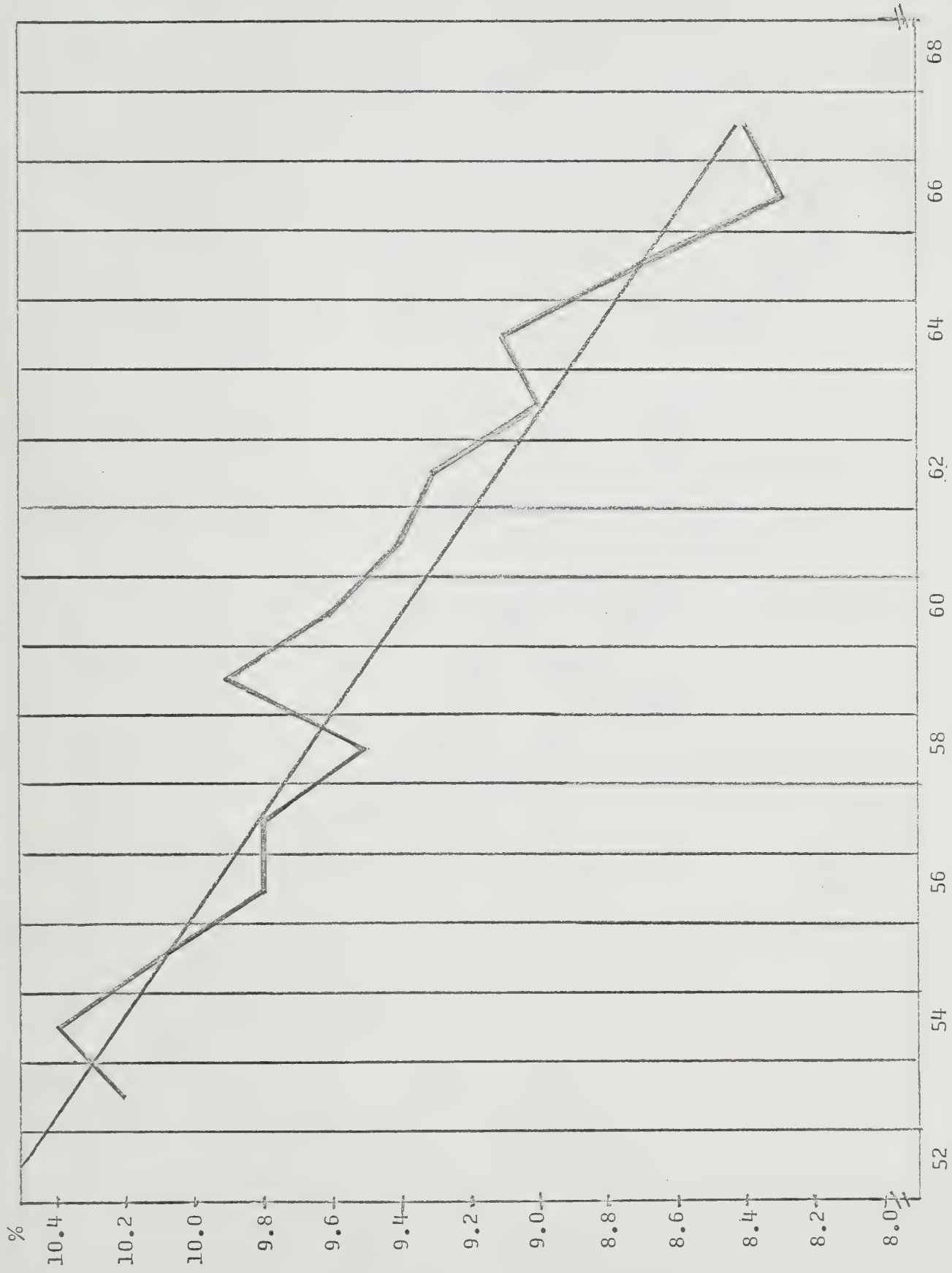


FIGURE 37: FEMALE PRODUCTION WORKERS AS A PERCENT OF
TOTAL FEMALE WORKERS

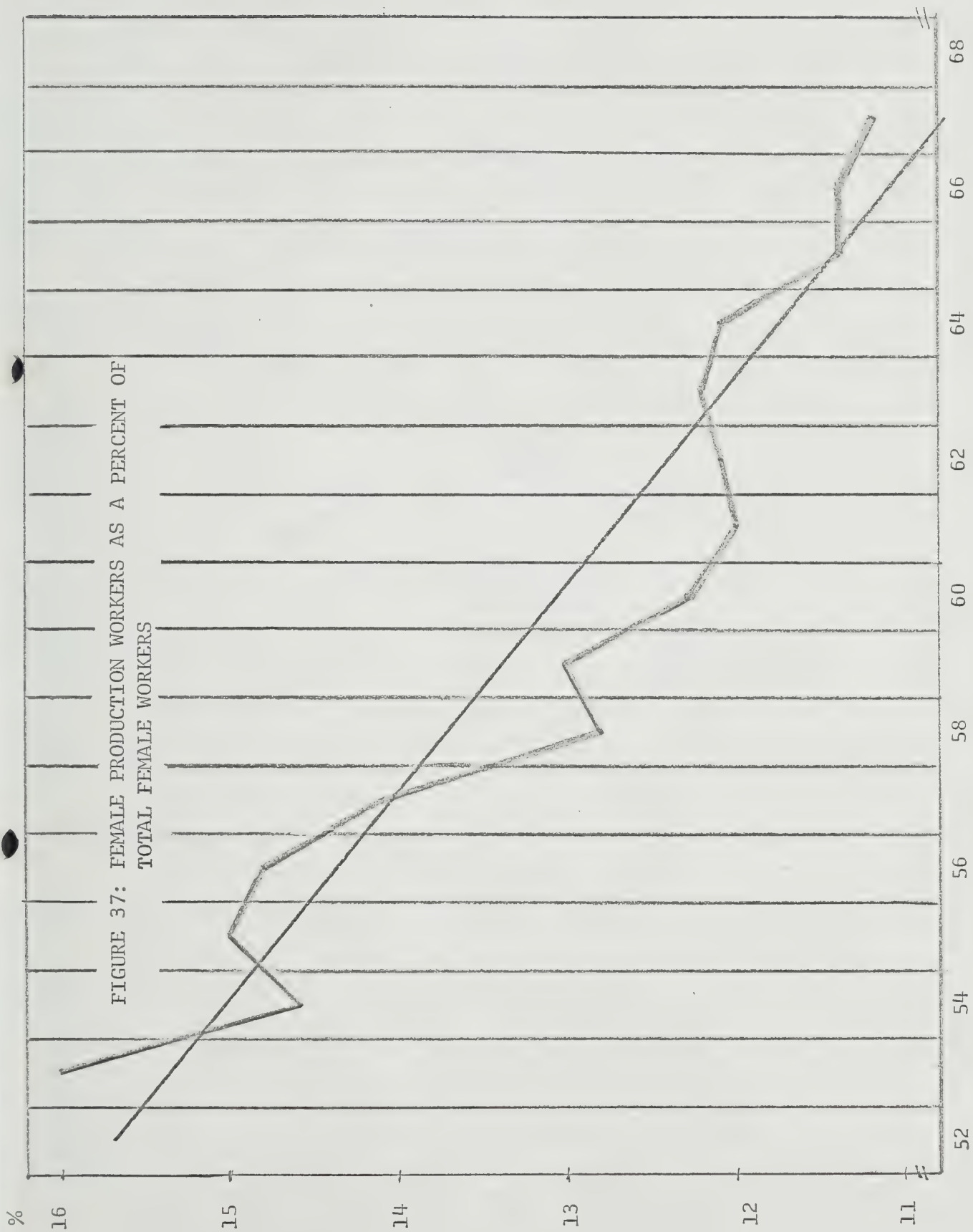


FIGURE 38: FEMALE SERVICE WORKERS AS A PERCENT OF TOTAL FEMALE WORKERS

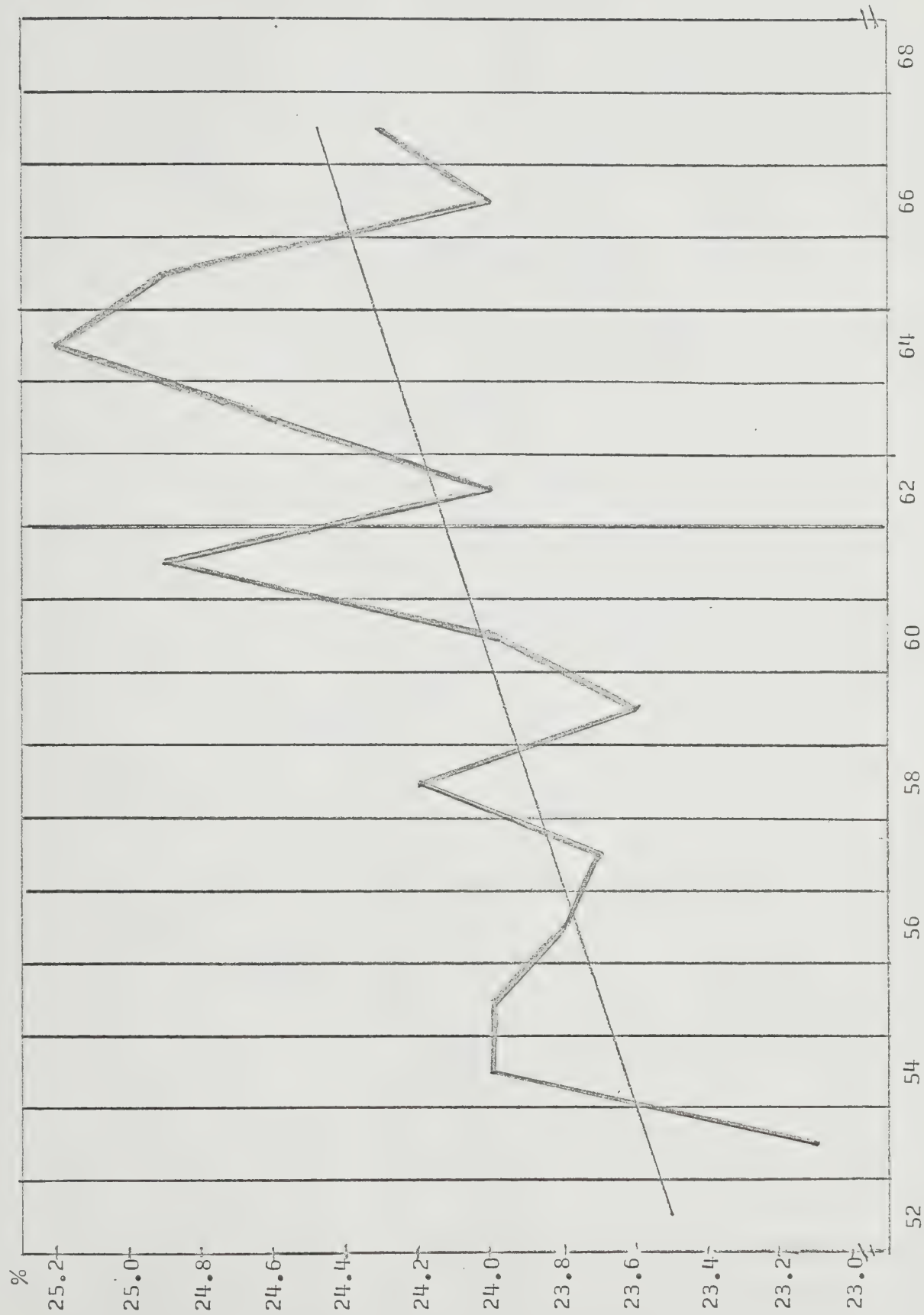


FIGURE 39: FEMALE OFFICE WORKERS AS A PERCENT OF TOTAL FEMALE WORKERS

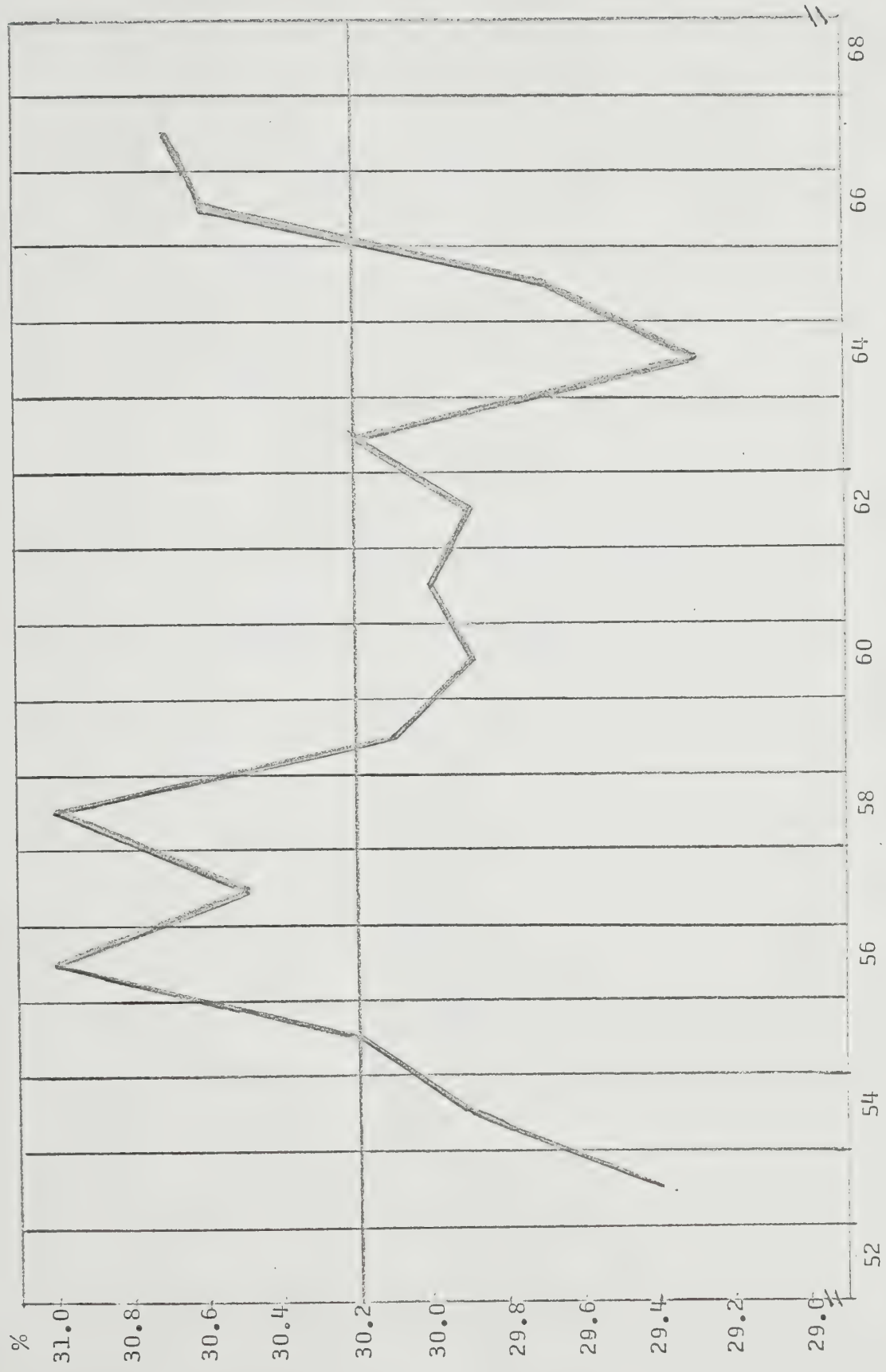


FIGURE 40: FEMALE MANAGERS (AND EXECUTIVES) AS A PERCENT OF TOTALE FEMALE WORKERS

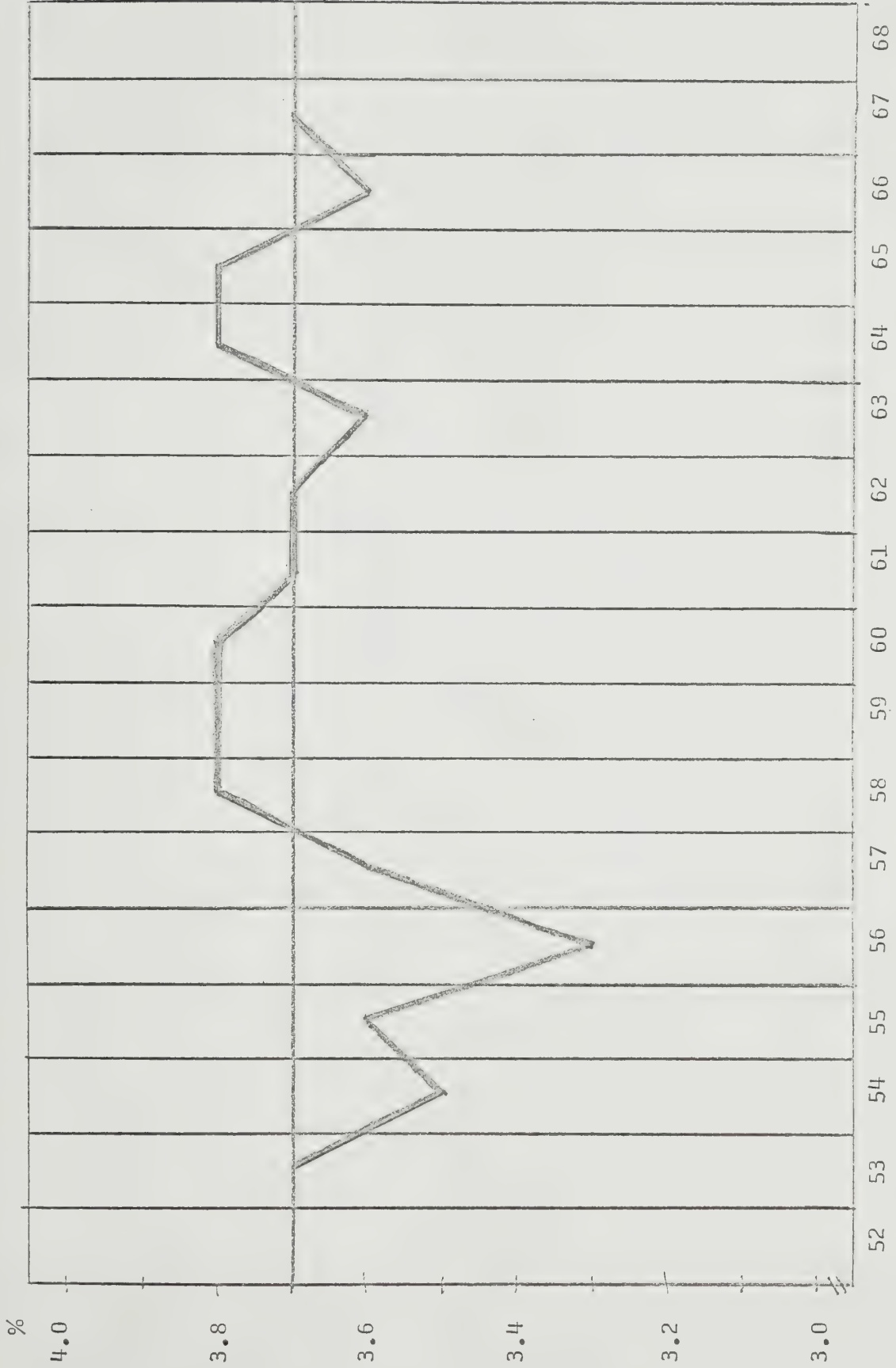


FIGURE 41: FEMALE PROFESSIONALS AND TECHNICIANS AS A PERCENT OF TOTAL FEMALE WORKERS

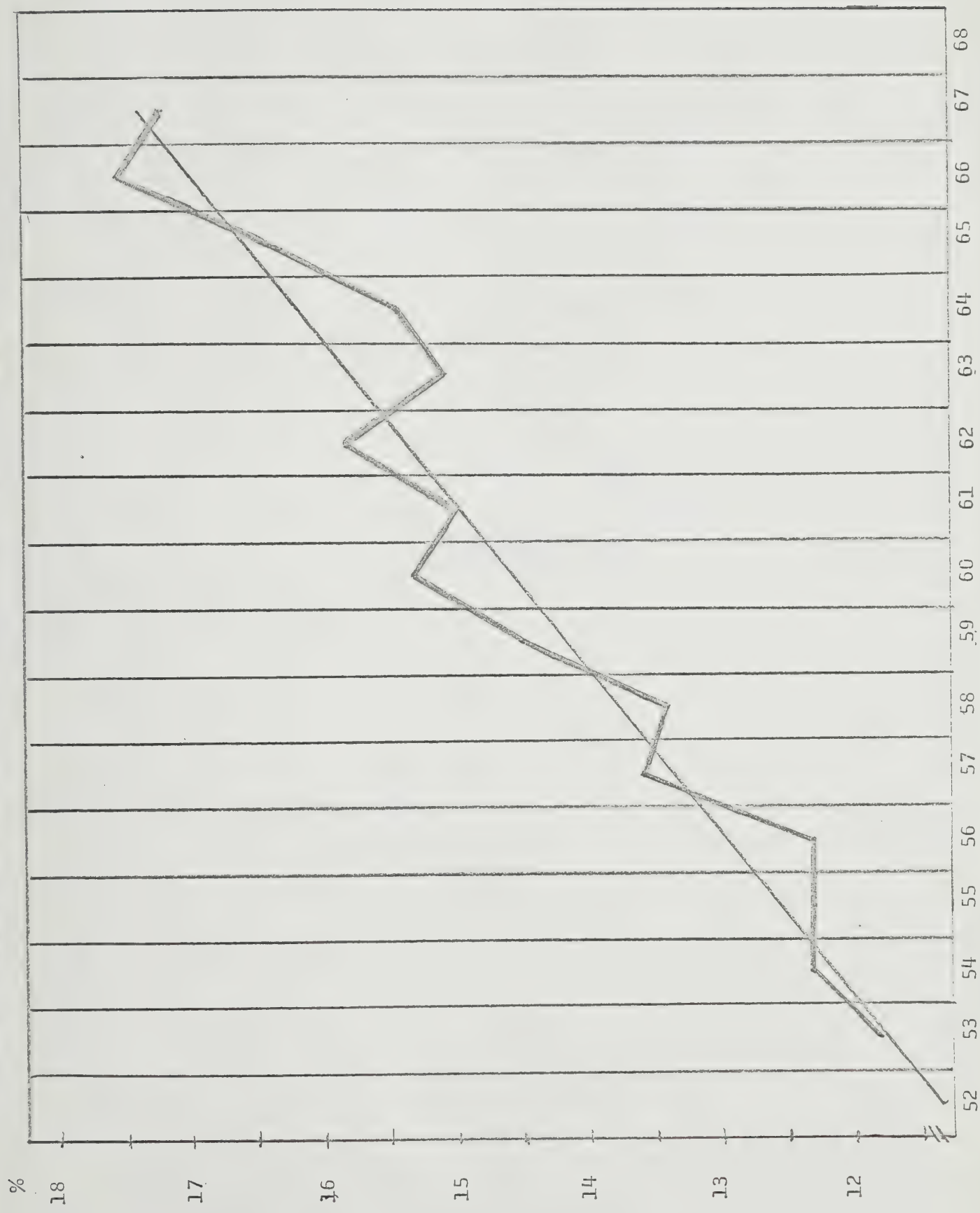


FIGURE 42: FEMALES IN UNSPECIFIED OCCUPATION GROUPS AS A PERCENT OF TOTAL FEMALE WORKERS

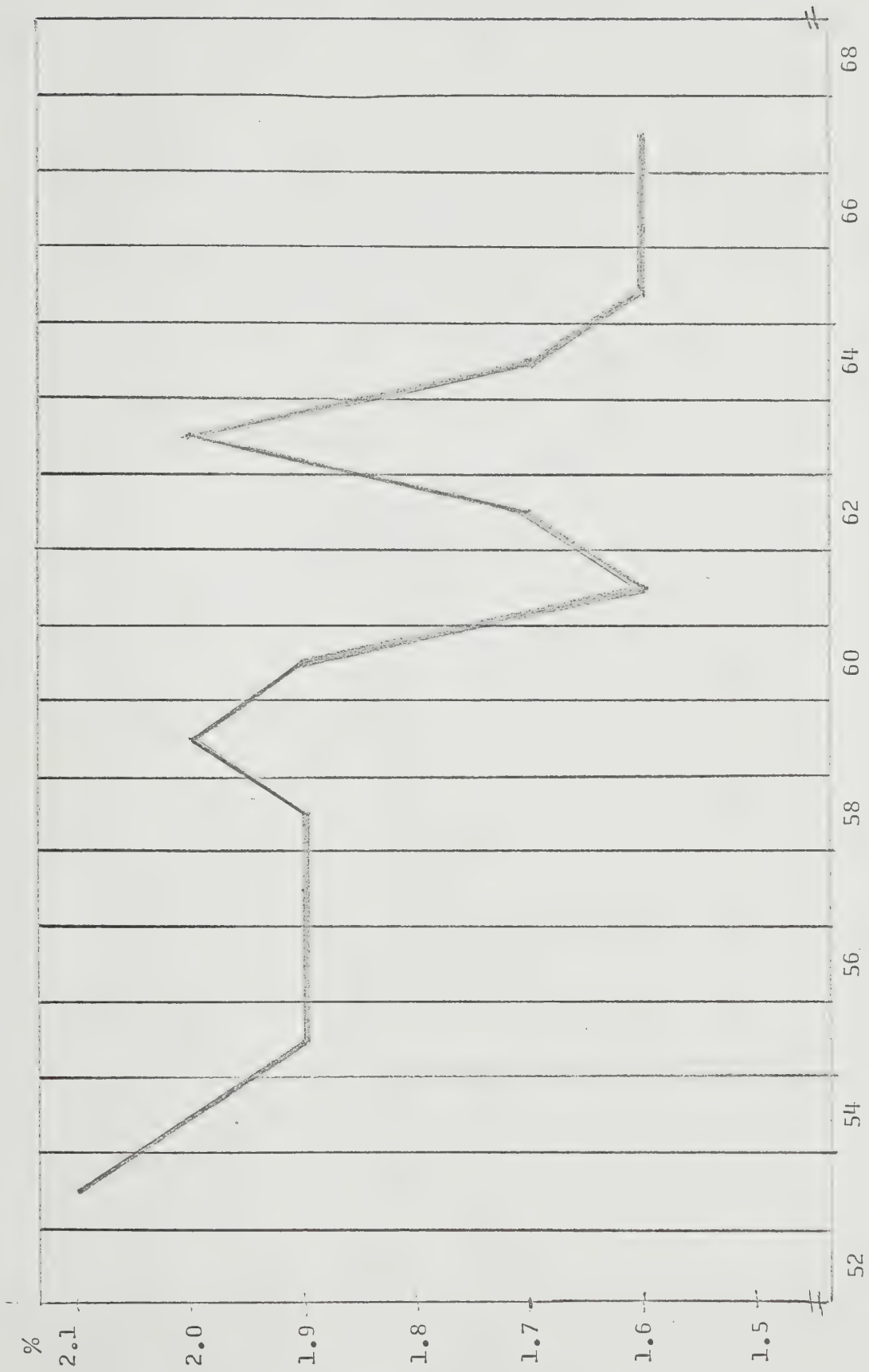


FIGURE 43: FEMALE EMPLOYMENT IN THE ATLANTIC REGION AS A PERCENT OF
TOTAL FEMALE EMPLOYMENT IN CANADA

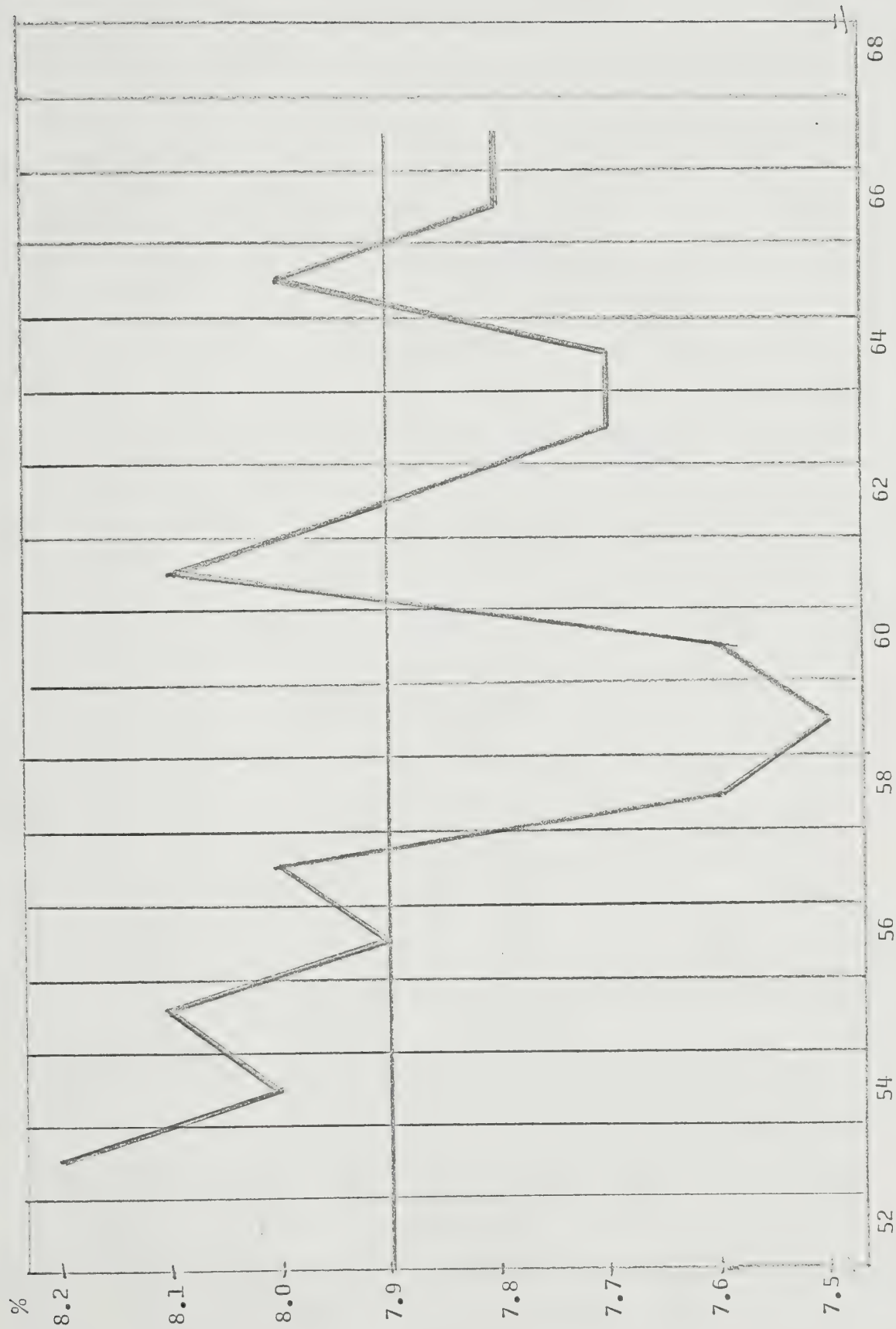


FIGURE 44: FEMALE EMPLOYMENT IN QUEBEC AS A PERCENT OF
TOTAL FEMALE EMPLOYMENT IN CANADA

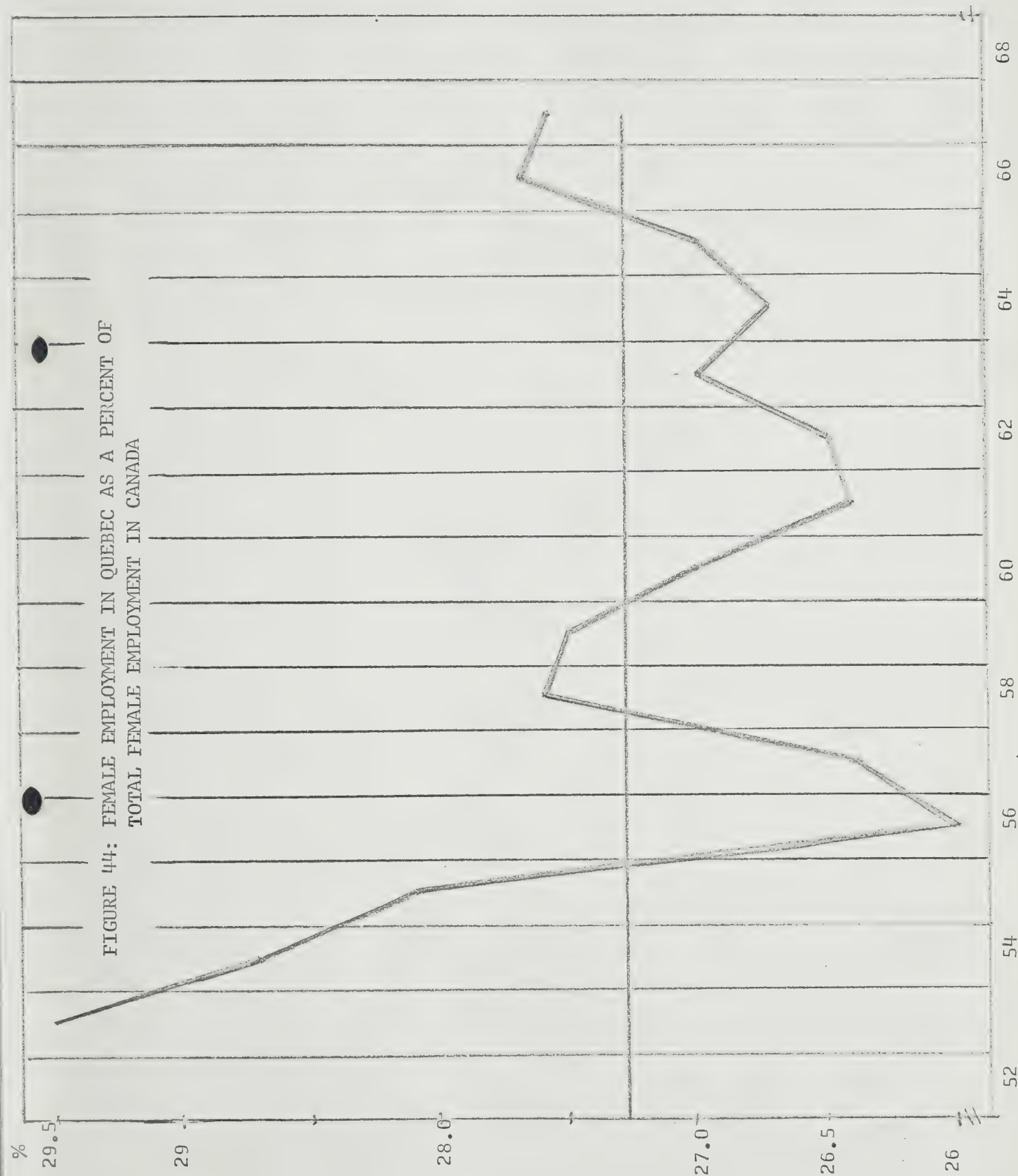


FIGURE 45: FEMALE EMPLOYMENT IN ONTARIO AS A PERCENT OF TOTAL FEMALE
EMPLOYMENT IN CANADA

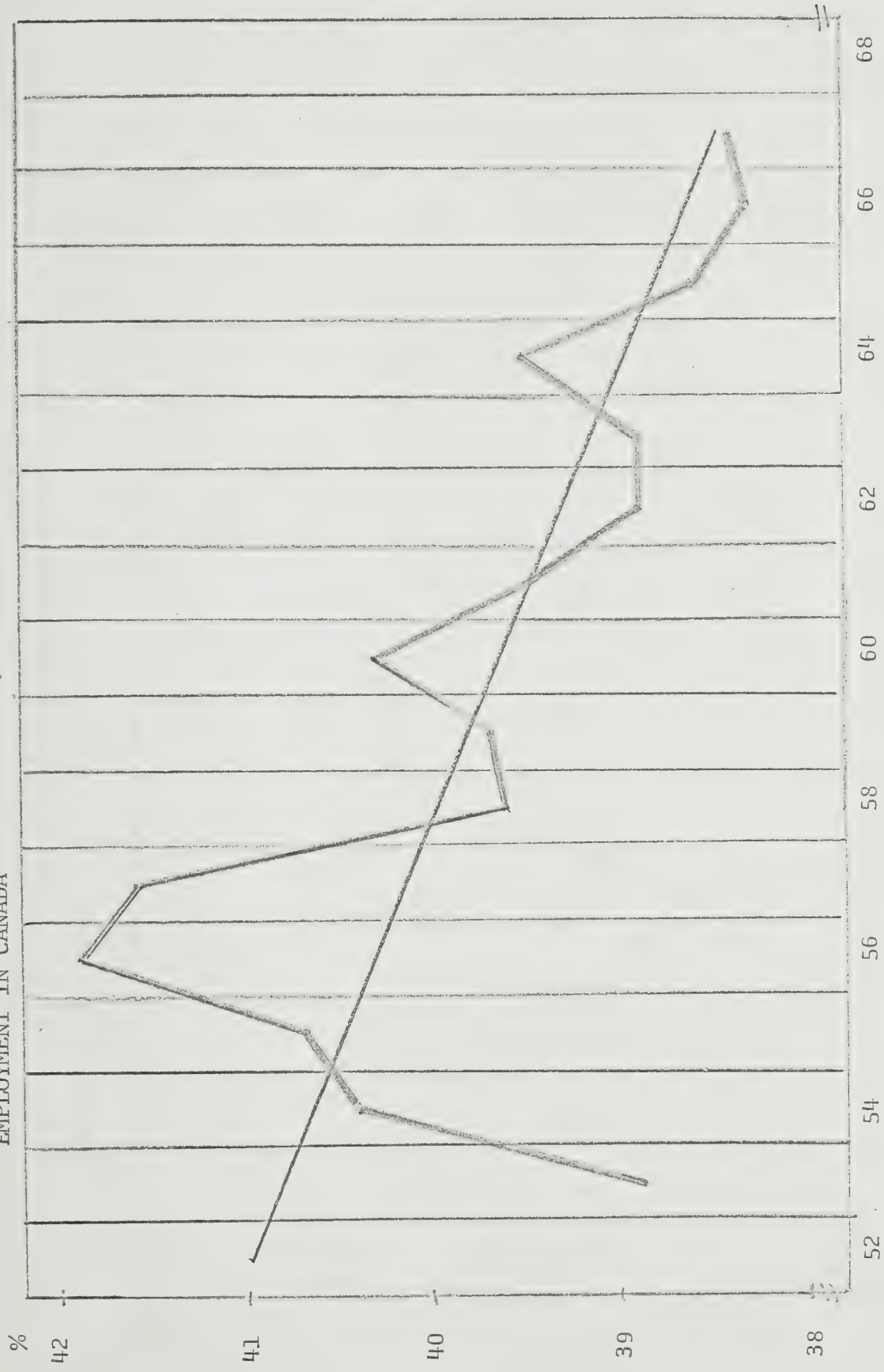


FIGURE 46: FEMALE EMPLOYMENT IN THE PRAIRIES AS A PERCENT OF TOTAL FEMALE
EMPLOYMENT IN CANADA

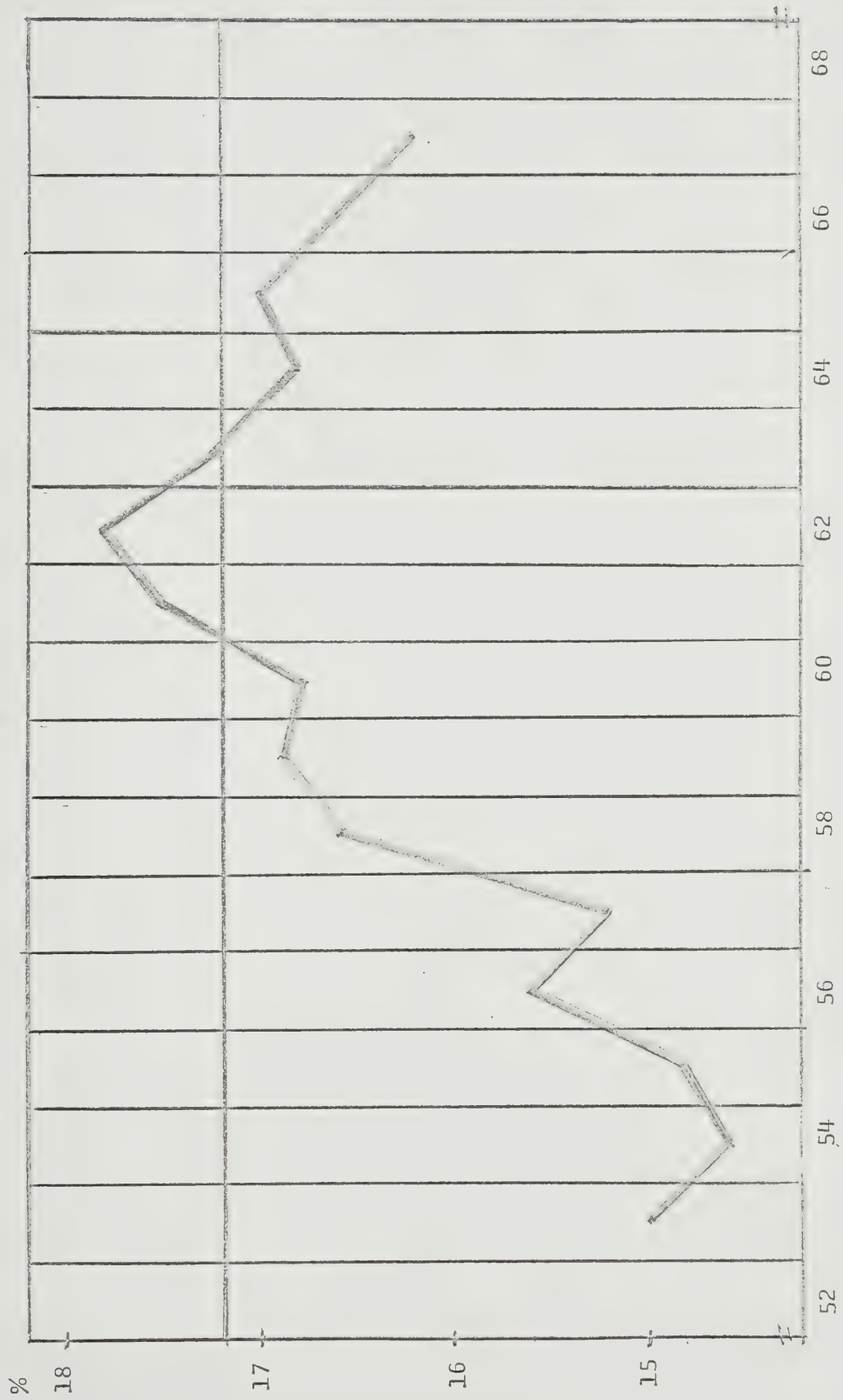


FIGURE 47: FEMALE EMPLOYMENT IN BRITISH COLUMBIA AS A PERCENT OF TOTAL FEMALE
EMPLOYMENT IN CANADA

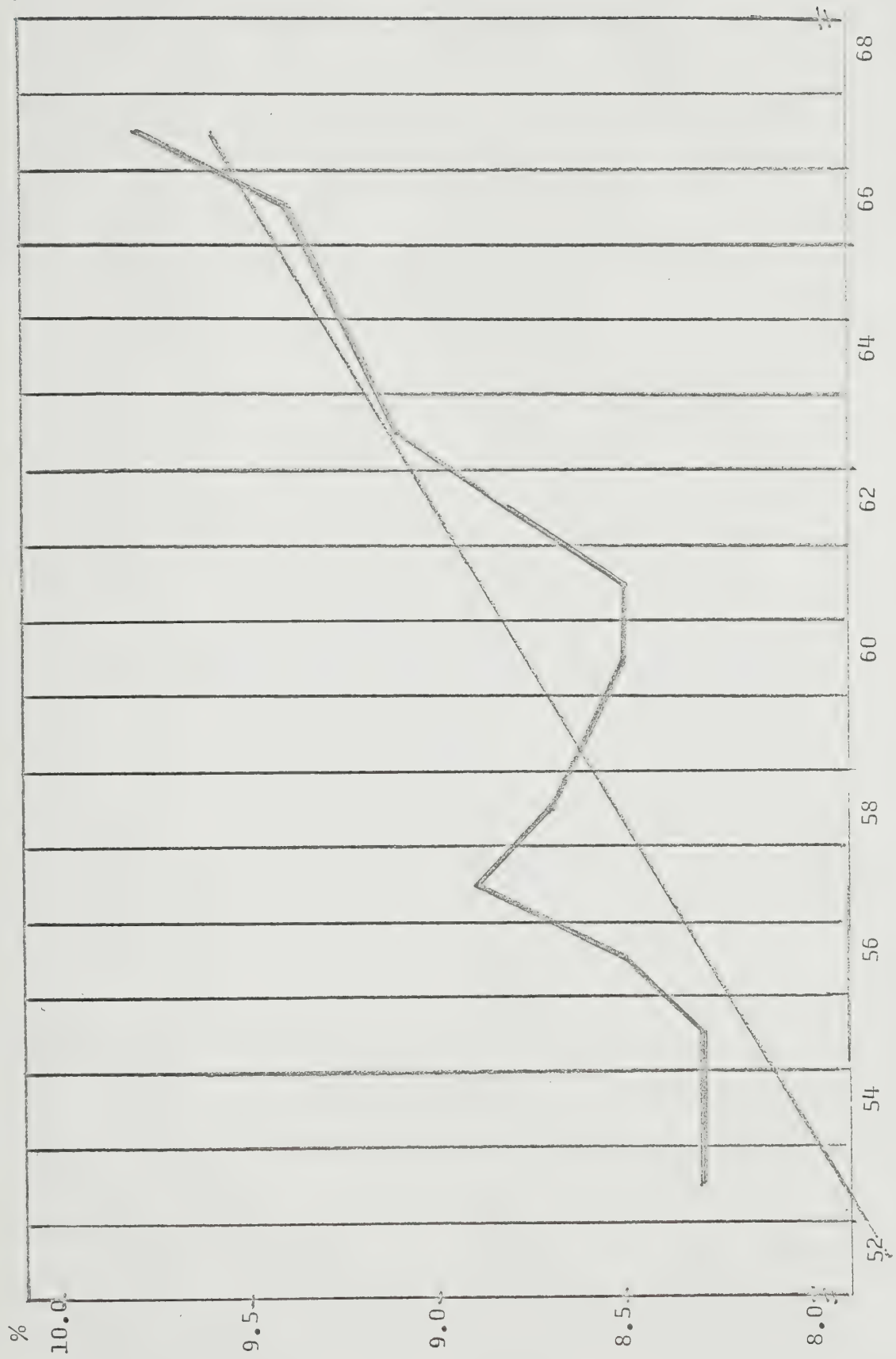


FIGURE 48: FEMALE EMPLOYMENT AS A PERCENT OF TOTAL EMPLOYMENT IN CANADA

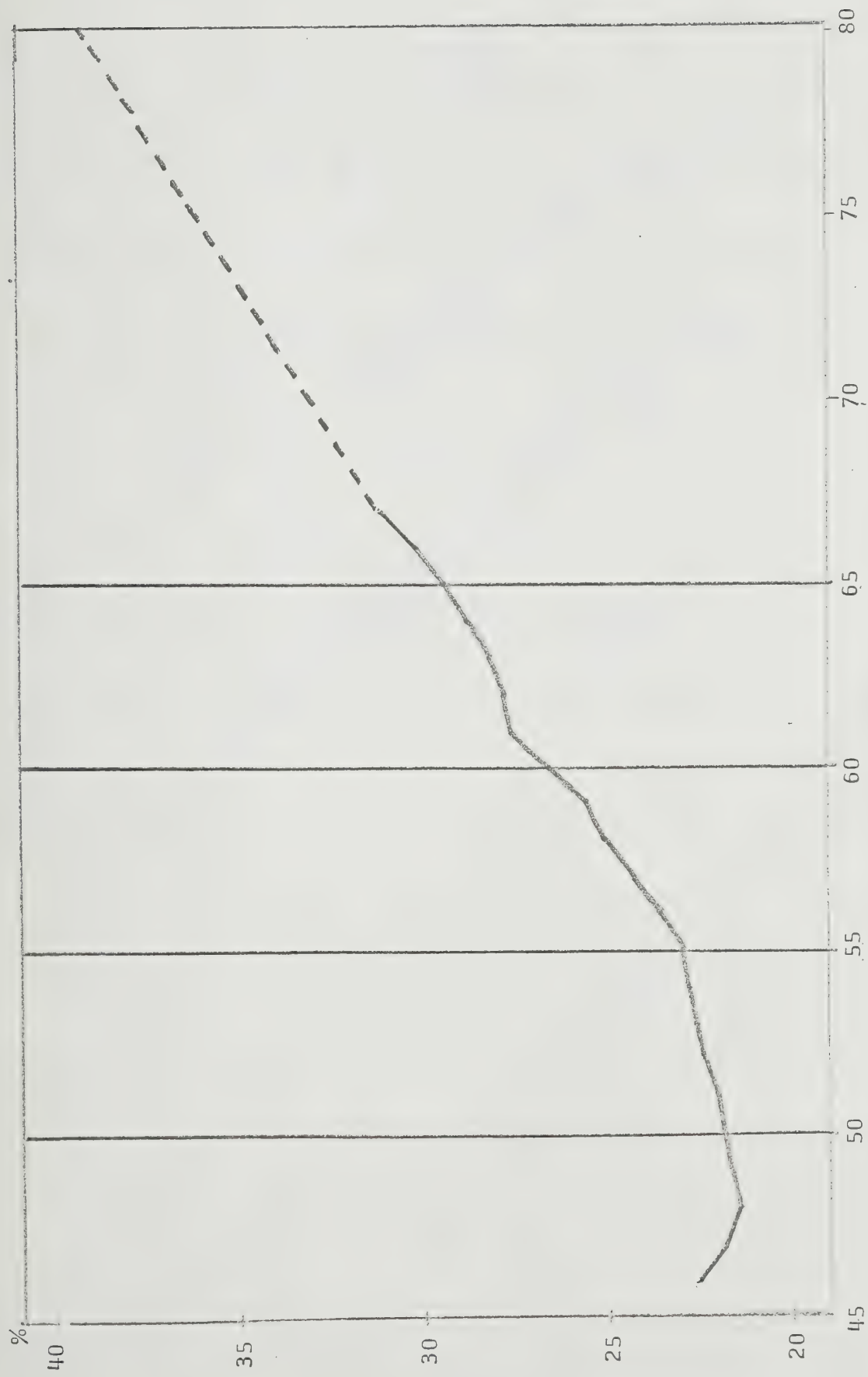


FIGURE 49

SELECTED FEMALE PARTICIPATION RATES
SCATTERGRAMS AND REGRESSION LINES, 1952-1966

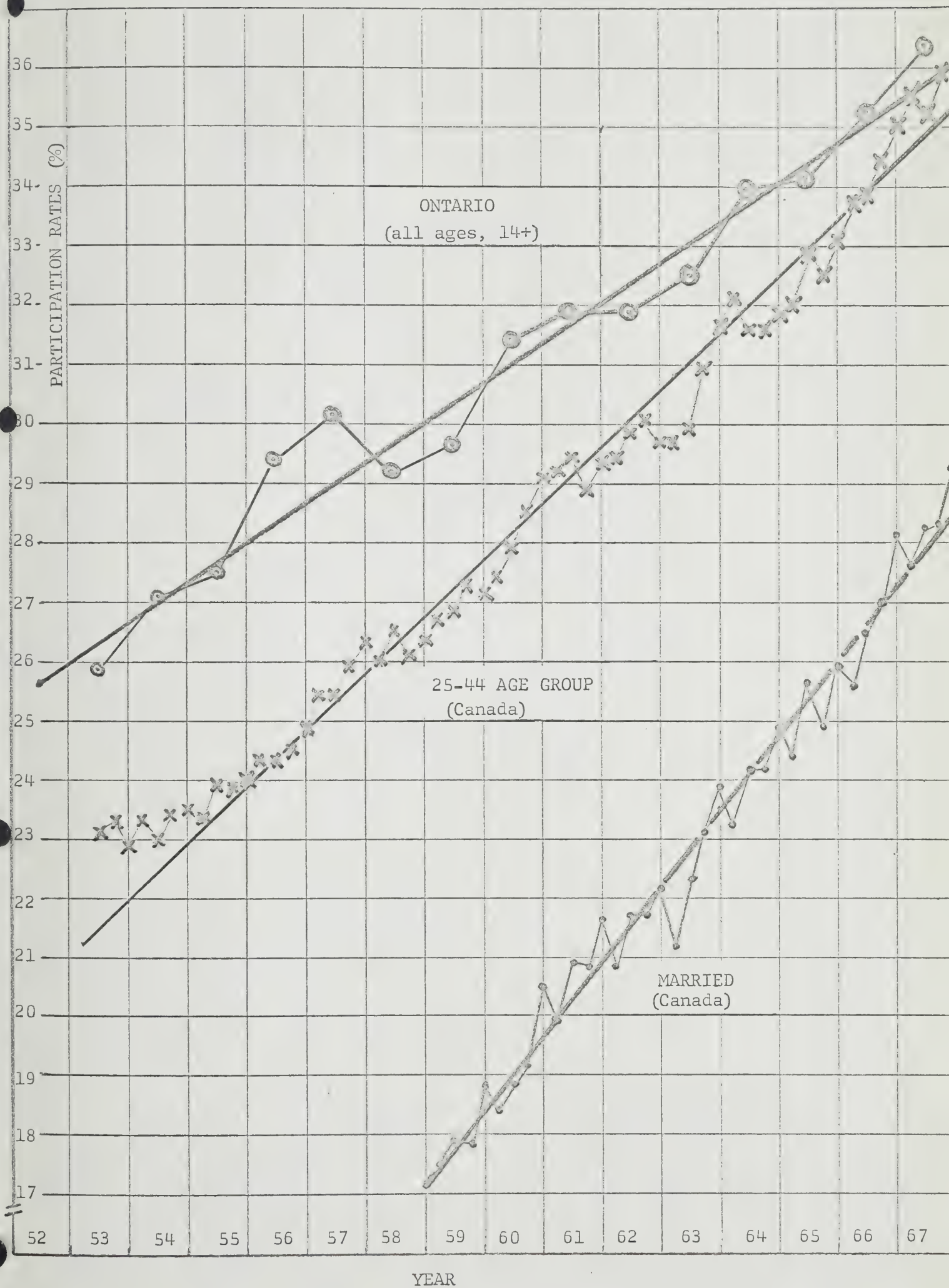


FIGURE 50

SCATTERGRAMS AND SEMI-LOGARITHMIC REGRESSION LINES FOR TOTAL EMPLOYMENT,
GROSS NATIONAL EXPENDITURE, GROSS DOMESTIC PRODUCT, PRODUCTION OF GOODS
AND PRODUCTION OF SERVICES, 1952-1966

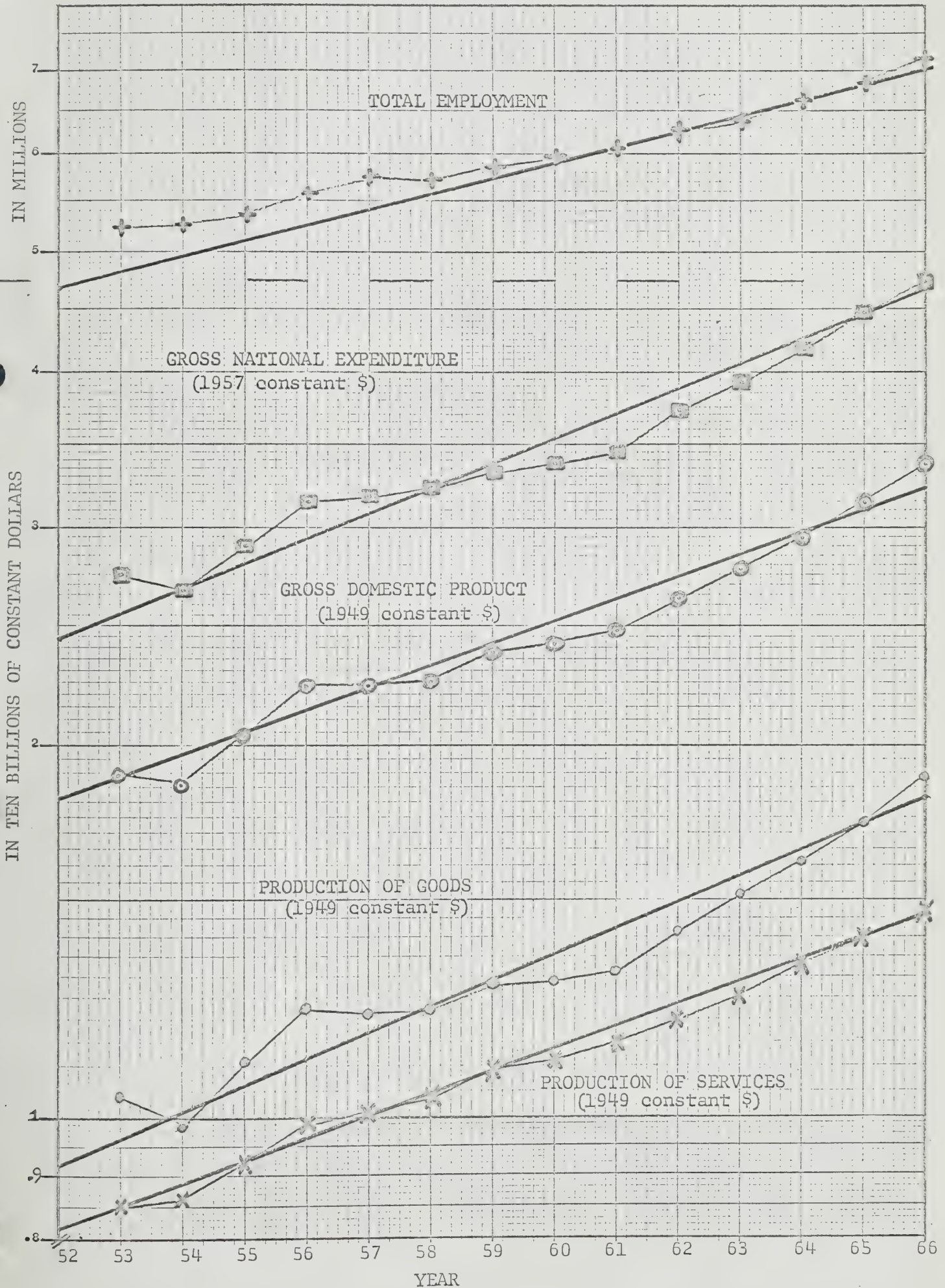


FIGURE 51 : PRODUCTIVITY (PRODUCTION PER WORKER)
IN THE PRIVATE SECTOR OF THE ECONOMY,
1953-66 (1949 = 100)

